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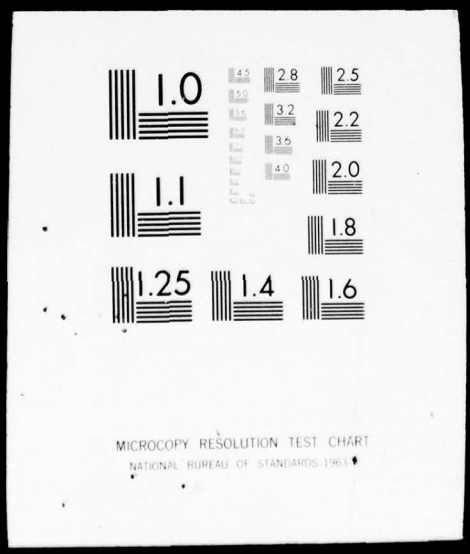
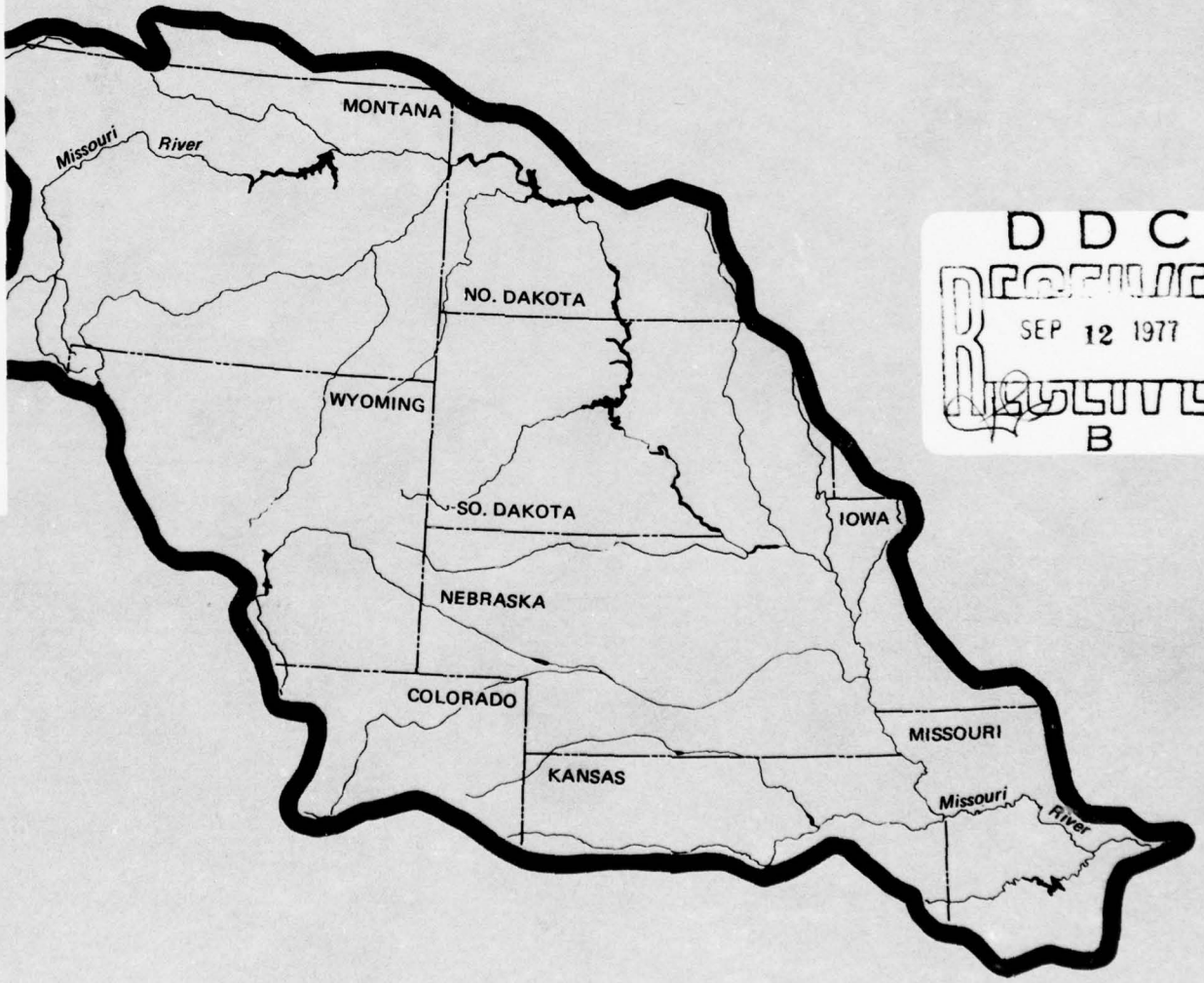


The Missouri River Basin Comprehensive Framework Study

- **Historical Perspective**
- **History of Study**
- **Existing Resources Development**

Volume 2 — Appendix



Missouri Basin Inter-Agency Committee
Standing Committee
June 1969

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MISSOURI RIVER BASIN

VOLUME 2.

APPENDICES.

HISTORICAL PERSPECTIVE OF THE MISSOURI RIVER BASIN.

HISTORY OF THE FRAMEWORK STUDY.

EXISTING WATER AND LAND RESOURCES DEVELOPMENT.

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COMPREHENSIVE FRAMEWORK STUDY

MISSOURI RIVER BASIN

REPORT

Volume 1 — Comprehensive Framework Study

APPENDICES

*Volume 2 — Historical Perspective of the Missouri River Basin

History of the Framework Study

Existing Water and Land Resources Development

Volume 3 — Laws, Policies, and Administration Related to Water Resources Development

Volume 4 — Economic Analysis and Projections

Volume 5 — Present and Future Needs

Volume 6 — Land Resources Availability

Hydrologic Analyses and Projections

Volume 7 — Plan of Development and Management of Water and Related Land Resources

*Covered in this Volume

COMPREHENSIVE FRAMEWORK STUDY
MISSOURI RIVER BASIN

APPENDIX

HISTORICAL PERSPECTIVE
OF THE MISSOURI RIVER BASIN

MISSOURI BASIN INTER-AGENCY COMMITTEE

June 1969

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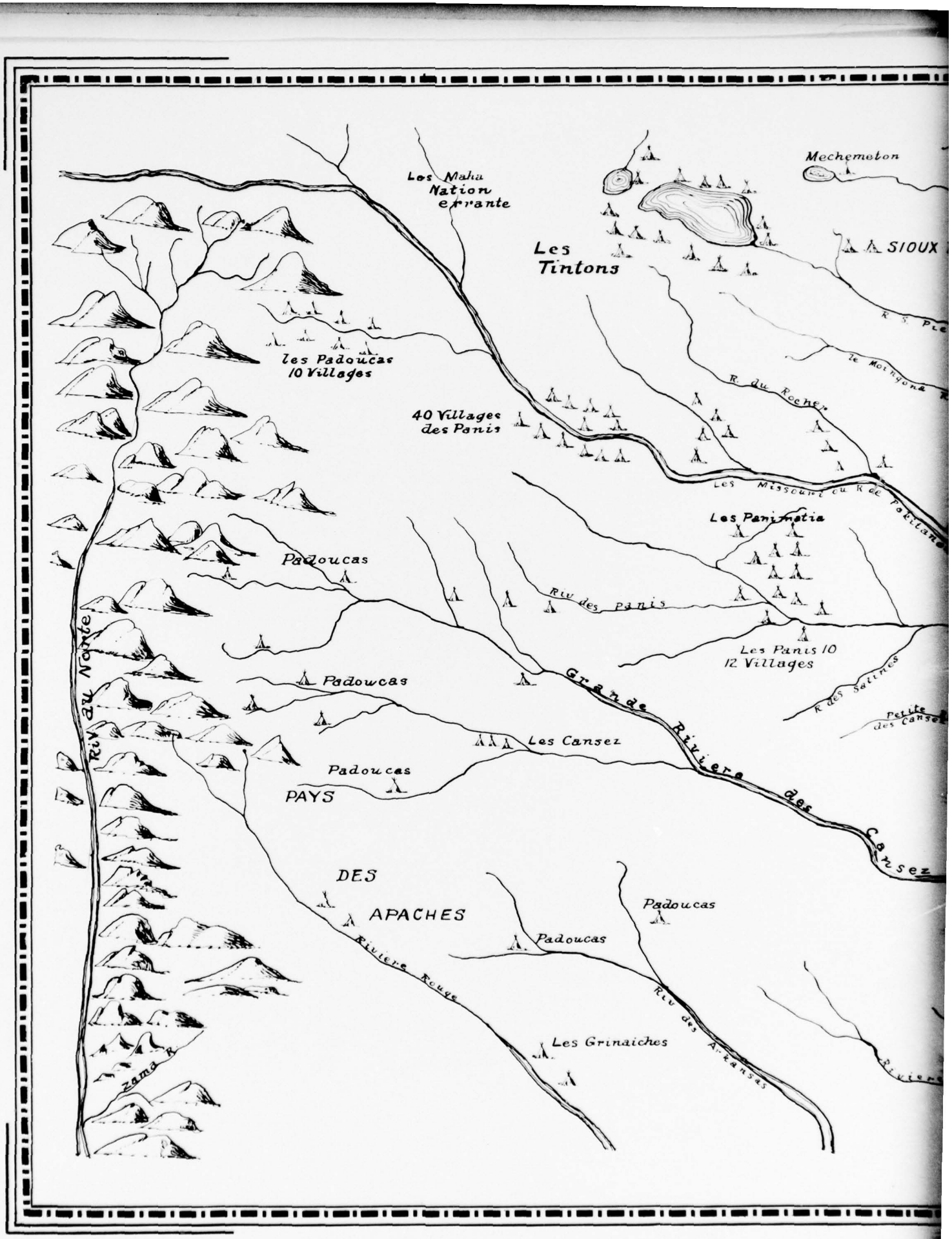
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Les Maha
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SIOUX
les Padoucas
10 Villages
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des Panis
R. du Rocher
Les Missouri ou R de Portland
Les Panimatia
Padoucas
Riv des Panis
Les Panis 10
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Padowcas
Riv au Norte
Grande Riviere des Cansez
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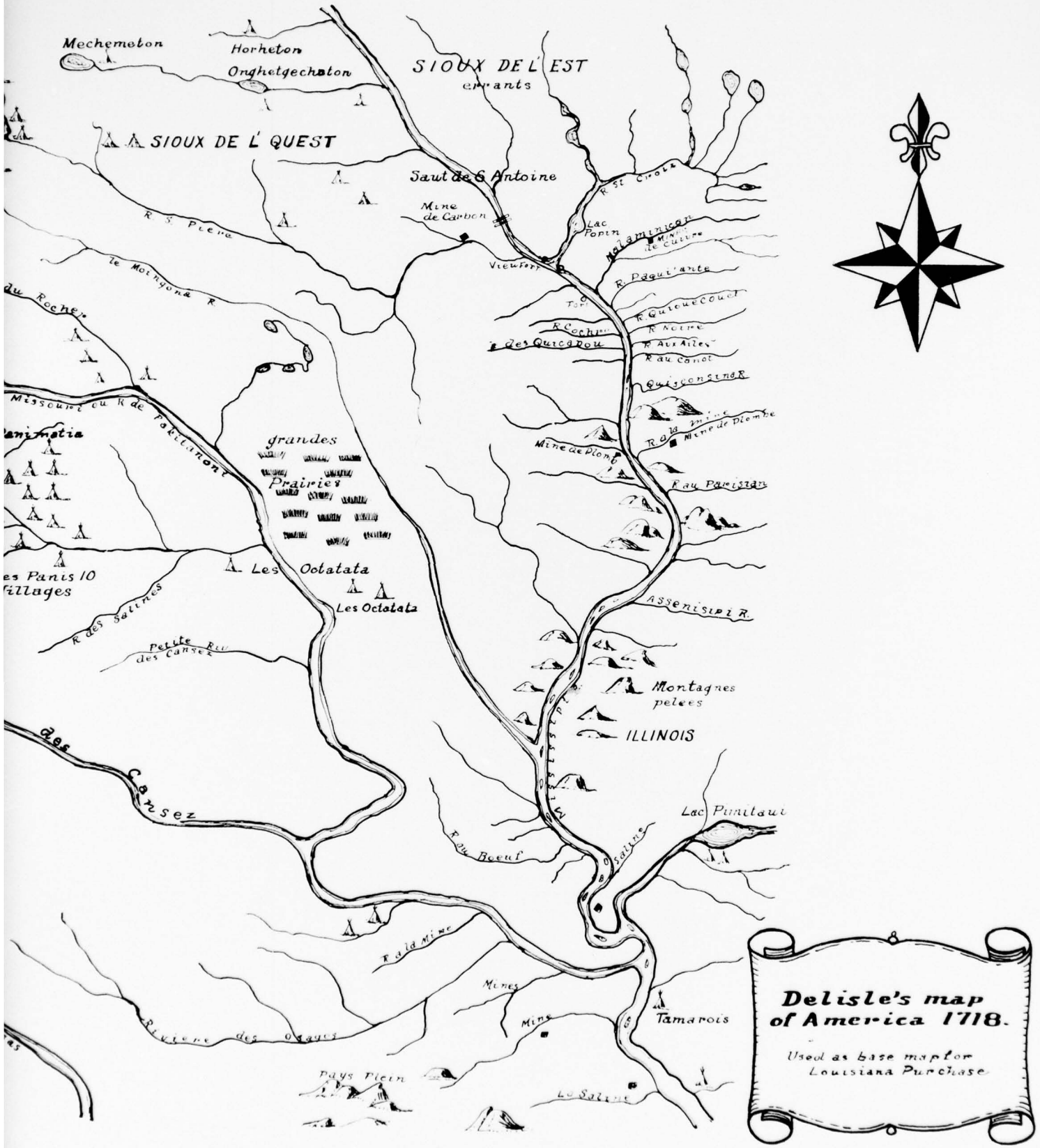


Delisle's map of America 1718.

Used as base map for Louisiana Purchase

PLATE I

FOREWORD

The Missouri River Basin has had a colorful history packed with action leading to its present development. A brief history of this development is presented here for a better understanding of the needs of its people for further development of the water and related land resources. The History was prepared by a special task force designated by the Standing Committee for Comprehensive Planning.* Its members drew upon numerous sources of information, all of which are gratefully acknowledged, including the use of photographs, figures, and plates appearing throughout the Appendix.

Since the days when the first Spanish, French, and English adventurers slowly made their way into the untamed North American wilderness, rivers of the continent have marked lines of exploration and commerce, and boundaries of conquest. Certainly this has been true of the Missouri River.

During the 17th and 18th centuries, both France and Spain claimed the Louisiana Territory, which included all the Missouri River Basin. European explorers had penetrated the fringes of the basin. After purchase of this land in 1803 by the United States, the Lewis and Clark Expedition, sent out by President Thomas Jefferson, completed the first crossing of the continent, via the Missouri and Columbia rivers.

Since the basin first was opened to settlement it has developed rapidly, advancing from a land inhabited mainly by nomadic Indians to a state of settlement economy, and society comparable with the rest of the Nation. The historical beginnings of the West appear here. This is the country of the voyageurs, fur traders, and pathfinders for westward expansion. The history of the region is interlaced with interesting events and places relating to the first adventurous trappers, miners, the first white men, the Civil War, and Indian wars.

The name "Missouri" is of Indian origin, and there are several versions of its derivation and its meaning. Early French maps showed an Indian tribe camped along the banks of the Osage River called the "Emissourites." Lewis and Clark interpreted this as meaning "Muddy River." A similar version is that Marquette and Joliet named the river Missouri after a Sioux Indian tribe camped along the banks. This tribe was first called the "Mizzou," later the "Missourites," and finally "Missouri."

Still another possible derivation, the Indian word for all nations west of the Mississippi River, was "Misouris" or "We-mis-u-re" interpreted literally as people who use wooden canoes. This was similar to the Algonquin word "Canoe-haver" which was applied to a single tribe on the river.

One imaginative version is associated with the word used by the Ojibwa or Chippewa Indians which meant "the great lizard that has its tail in the ice and snow and its mouth in the warm water." To early French explorers, this word sounded like "Missouri."

An early concept of the basin is illustrated by Delisle's map of America, dated 1718, shown in plate 1. It may be noted that the French version of Missouri was included in the name for the river at this early date. A study of this map will also show that the names of several rivers, places, and Indian tribes probably were taken from early French nomenclature.

*Members of the special task force included Paul L. Harley (Chairman), Kenneth B. Schroeder and Burton V. Coale, all of the Department of the Interior; Allen L. Fisk, Department of Agriculture; and Charles A. Cocks and Robert D. Burns, Department of the Army.

CHAPTER 1

THE GENERAL SETTING

Even though the legend of the great lizard may have been a figment of the Indians' imagination, it does provide a picturesque description of the Missouri River, which stretches from the snow-covered Rocky Mountains to the much warmer south. As shown by figure 1, it rises high in the Rockies of western Montana, flows northeastward, east, and then southeast from mountainous timbered areas through foothills, through the Great Plains, and down through the lowland of the southeastern part of the basin, joining the Mississippi River near St. Louis.

The area is one of physical extremes, from high mountains – some forested, some barren – and high valleys, arid and semiarid foothills and plains, to subhumid and humid areas, with elevations ranging from above 14,000 feet down to less than 400 feet. In the upper reaches, the fall of the rivers and creeks is rapid, steadily diminishing until, in the lower reaches of some of the tributaries and on the main stem of the Missouri River, the currents are relatively slow.

Old and young rocks – igneous, metamorphic, and sedimentary – as well as deposits too young and unconsolidated yet to be called rocks, form the geologic framework of the Missouri River Basin as illustrated by figure 2. This plays an important role in the economic development of the basin.

The Missouri Basin is divided into three main physiographic divisions – the Rocky Mountain System, Interior Plains, and Interior Highlands. The Rocky Mountains rise abruptly 2,000 to more than 8,000 feet above the adjacent plains and provide a striking contrast in topography.

The Rocky Mountain System is a series of bold, generally rugged, north- to northwest-oriented ranges separated by broad valleys or nearly flat basins. Craggy sawtooth ridges and majestic peaks of bare rock form the Continental Divide, whose higher summits range in altitude to more than 14,000 feet. These summits, together with fast-flowing streams in deep, steep-walled gorges, crystal clear lakes, perennial snowbanks, and small glaciers in high level cirques provide a magnificent alpine beauty.

The Great Plains can be thought of as displaying three general surfaces within the basin. The surface in the southern part of the basin is gently rolling to nearly flat with low rounded ridges rising here and there above flat-bottomed stream valleys. The plains in Wyoming, Montana, and on the west side of the Missouri River in the Dakotas have been eroded to form a fairly broken topography. The major streams tend to be well entrenched below the plains surface, have rather narrow valleys, and are flanked by zones of gullies or badlands. Only the interfluvial uplands retain the rolling plains characteristics.

North and east of the Missouri River the Great Plains have been modified by several periods of continental glaciation. The land surface is gently rolling and interspersed with numerous winding ridges of glacial debris. Generally, the streams occupy wide shallow valleys and tend to have fairly flat gradients. There are several large areas where the surface runoff collects in land-locked lakes or sloughs and does not directly contribute to the streams.

The Central Lowlands portion of the basin is a long north-south trending area bounded on the west by the Great Plains and on the south by the Ozark Plateaus. The lowlands are composed of broad, rolling prairies which are significantly lower in elevation than the Great Plains, their northern half having been glaciated and the southern part forming a transition zone between the Great Plains and the Ozark Plateaus.

A succession of glacial moraines characterizes the land surface of the glaciated portion of the lowlands. These moraines tend to be irregular and have many lakes, swamps, and boulder fields associated with them. Between the morainal ridges is a ground moraine or till plain, generally smoothly rolling and constituting the larger part of the area.

Wind-blown deposits or loess cover the southern portion of the glaciated area. This section is probably the most highly developed agricultural land within the basin and represents the western edge of the Corn Belt.

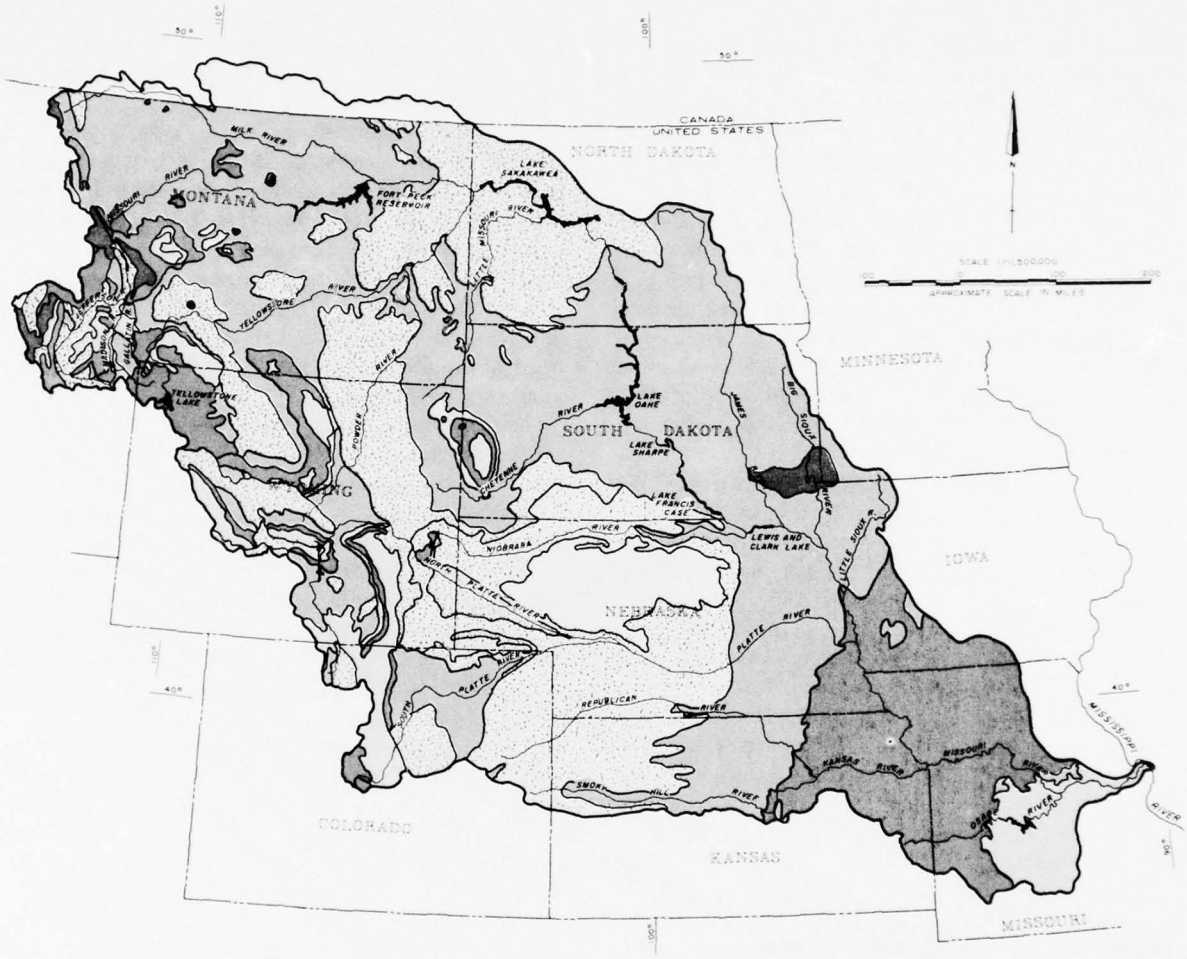
The southernmost portion of the basin is the Ozark Plateaus province. This area is composed mainly of rolling uplands which have rather steep, well dissected flanks. The major streams are well entrenched in narrow valleys and tend to have short, steep-sided lateral tributaries.

FIGURE 1

PHYSIOGRAPHIC DIVISIONS, PROVINCES, SECTIONS, AND SUBSECTIONS

FIGURE 2

BASIN GEOLOGY



LEGEND

SEDIMENTARY ROCKS

- QUATERNARY — RECENT AND PLEISTOCENE
- UPPER TERTIARY — PLIOCENE AND MIOCENE; In Western States includes Recent and Pleistocene
- LOWER TERTIARY — OLIGOCENE, EOCENE, AND PALEOCENE
- CRETACEOUS — In parts of Rocky Mountains includes Jurassic and Triassic
- JURASSIC AND TRIASSIC
- UPPER PALEOZOIC — PERMIAN, PENNSYLVANIAN, AND MISSISSIPPIAN; In parts of Rocky Mountains includes middle and lower Paleozoic
- MIDDLE PALEOZOIC — DEVONIAN AND SILURIAN
- LOWER PALEOZOIC — ORDOVICIAN AND CAMBRIAN; In parts of Missouri includes *Devonian and Silurian*
- YOUNGER PRECAMBRIAN
- OLDER PRECAMBRIAN — Metamorphic and igneous rocks

VOLCANIC ROCKS

- QUATERNARY AND TERTIARY — Includes small areas of intrusive rocks

INTRUSIVE ROCKS

- LOWER TERTIARY, MESOZOIC, AND PALEOZOIC — Chiefly granitic rocks; Lower Tertiary and Mesozoic in Western States and Paleozoic in *eastern United States*

In general the soils of the basin are satisfactory for agricultural uses. Most of them are naturally fertile and some are well supplied with organic matter. Almost all of the soils will support excellent grass cover and cropland is found in all areas of the basin. Major land resource regions comprising geographically associated land resource areas are shown in figure 3.

Mineral deposits abound in numerous places in the basin. Metallic minerals are found in the mountainous and foothill areas of Montana, Wyoming, Colorado, and in the Black Hills. The most important metals are gold, iron, molybdenum, and uranium. Nonmetallic minerals, primarily construction materials, are found throughout the basin.

The greatest mineral resources of the basin are the fossil fuels. Oil and natural gas fields are found in Montana, Wyoming, Colorado, Kansas, and North and South Dakota. The northern Great Plains are underlain with billions of tons of sub-bituminous coal and lignite. This resource has not been significantly developed in the past because of distance from major markets but it has a tremendous future potential, primarily in the production of electrical power.

Primarily because of its mid-continental location, the basin experiences fluctuations and extremes in weather. Winters are relatively long and cold over much of the basin while summers are fair and hot. Spring is cool, humid, and windy; and autumn is cool, dry, and fair. Normal average annual precipitation ranges from about 40 inches in parts of the Rocky Mountains and southeastern parts of the basin to as low as 6 to 12 inches immediately east of the Rocky Mountains. The basin regularly experiences above-100-degree temperatures in summer and below-zero temperatures in winter over most of its area. The number of consecutive days above 32°F. for the nonmountainous areas ranges from about 90 to 180 days each year. Average wind velocities of 10 miles per hour are prevalent over much of the basin. Cyclonic and tornadic winds occasionally do considerable damage, and when accompanied by snow, the strong winds create blizzard conditions dangerous to man and livestock in the plains area. Climatic zones associated with natural vegetation are shown in figure 4.

Eight million inhabitants of the Missouri River Basin are distributed in three major zones of occupation — the eastern, middle, and western zones. Each zone represents a distinctive cultural adjustment to conditions of the natural environment.

The eastern zone comprises about one-third of the basin and is characterized by moderately dense settlement, a relatively stable and diversified agriculture, and an increasingly important urban life which is based in large part on the manufacture and distribution of commodities used or produced in the middle or western zones of the basin. It contains far more people than do the western and middle zones. Within the eastern zone the population exceeds 12 persons per square mile, and in some localities 100 or more persons, gradually diminishing to the west. During the last two decades the cities have grown consistently while the populations of most rural districts have declined.

This eastern zone is also the commercial front. Cities along the lower reaches of the Missouri River are commercial intermediaries for the rest of the basin. They stand as junction points between the closely spaced railroad pattern of the east and the transcontinental lines of the west.

Throughout most of the eastern zone at least 55 percent of the land is tilled. The farm units are of moderate size and agriculture is generally a diversified grain and livestock enterprise. The eastern part of this zone lies within the Corn Belt and accounts for the westward bulge of comparatively high population density into Kansas and Nebraska. Winter wheat merges with corn to the south and spring wheat to the north. Most of the zone has fertile soil where agriculture can be conducted productively.

In the western zone many mining towns declined as nearby mineral deposits were depleted or abandoned. A few towns which had their start as mining communities have continued to grow, partly because of the westward movement of small industries and partly because of the impetus of World War II. Denver is an outstanding example, with an attractive climate and environmental setting. Separating these various islands of growing population are sparsely settled mountainous areas, some forested and some semiarid high plains or plateaus, in large part publicly owned.

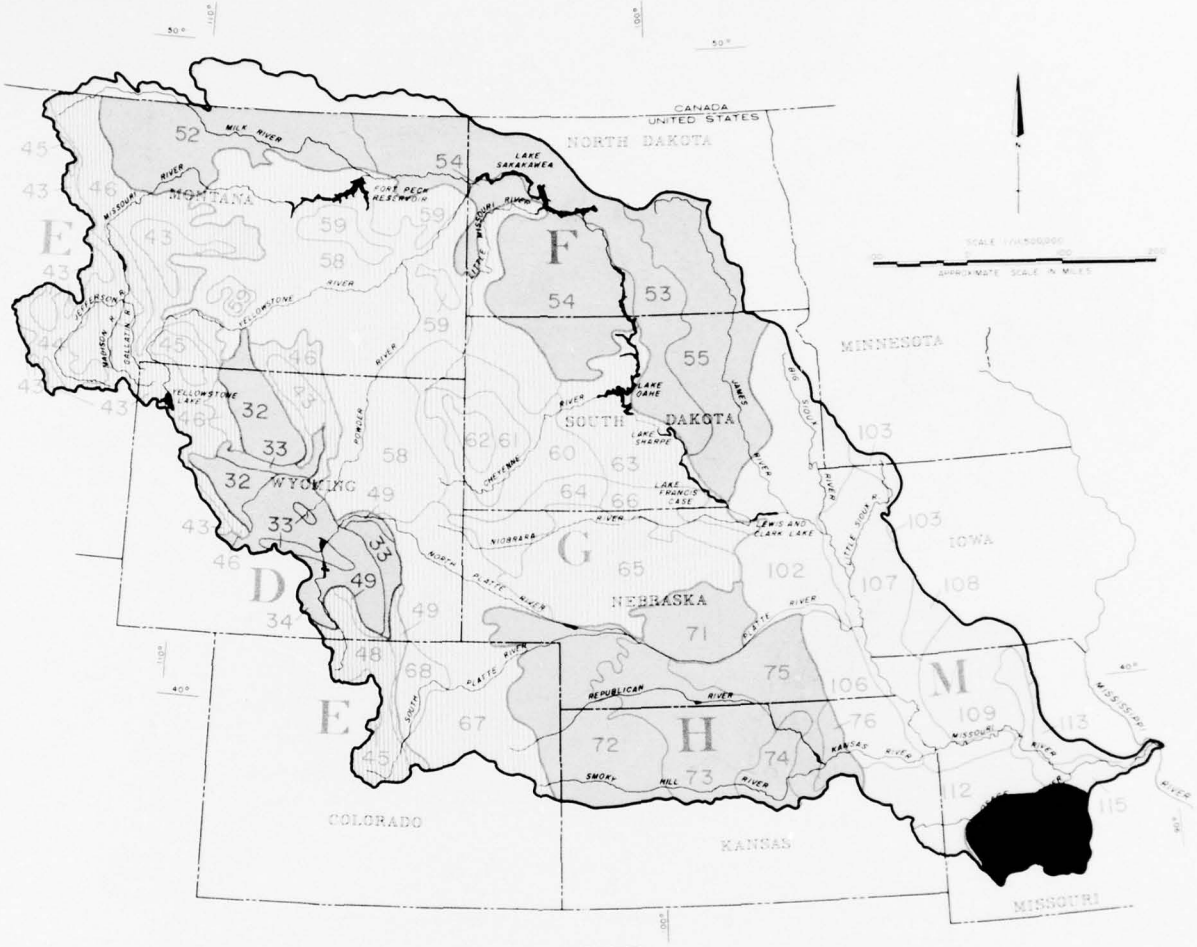
The irrigated portions of the intermountain basins and their fluvial valleys produce large yields of sugar beets, vegetables, and forage crops. Generally, the water supply in streams is used for irrigated agriculture that provides supplemental feed for livestock raised on pastures and open range in the surrounding plains and in the mountains. In these areas the sugar beet factory, the canning plants, grain elevators, and livestock feeding and loading yards are distinctive features of the scattered towns and cities.

Between the eastern and western zones lies a vast middle zone characterized by a relatively sparse and fluctuating population. In only a few places does the population exceed 12 persons per square mile. More often, it is six or less, and sometimes is as low as one person per two square miles. Settlement of the zone, which has in general followed the railroad lines, has been one of movements and countermovements of people from the early years of the present century (figure 5).

Since its first occupancy, the middle zone has been primarily dependent on agriculture. While dryland and irrigated farming is successfully practiced in the area, livestock raising predominates. The settlers found the same grasses that had supported the vast herds of buffalo

FIGURE 3

LAND RESOURCE REGIONS AND MAJOR LAND RESOURCE AREAS



LEGEND

D WESTERN RANGE AND IRRIGATED REGION

- Northern Intermountain Desertic Basins
- Semiarid Rocky Mountains
- Central Desertic Basins, Mountains, and Plateaus
- Southern Rocky Mountain Foothills

E ROCKY MOUNTAIN RANGE AND FOREST REGION

- Northern Rocky Mountains
- Northern Rocky Mountain Valleys
- Alpine Meadows and Rockland
- Northern Rocky Mountain Foothills
- Southern Rocky Mountains
- Southern Rocky Mountain Foothills

F NORTHERN GREAT PLAINS SPRING WHEAT REGION

- Brown Glaciated Plain
- Dark Brown Glaciated Plain
- Rolling Soft Shale Plain
- Black Glaciated Plains

G WESTERN GREAT PLAINS RANGE AND IRRIGATED REGION

- Northern Rolling High Plains
- Northern Smooth High Plains
- Pierre Shale Plains and Badlands
- Black Hills Foot Slopes
- Black Hills
- Rolling Pierre Shale Plains
- Mixed Sandy and Silty Tableland
- Nebraska Sand Hills
- Dakota - Nebraska Eroded Tableland
- Central High Plains
- Irrigated Upper Platte River Valley

H CENTRAL GREAT PLAINS WINTER WHEAT AND RANGE REGION

- Central Nebraska Loess Hills
- Central High Tableland
- Rolling Plains and Breaks
- Central Kansas Sandstone Hills
- Central Loess Plains
- Bluestem Hills

M CENTRAL FEED GRAINS AND LIVESTOCK REGION

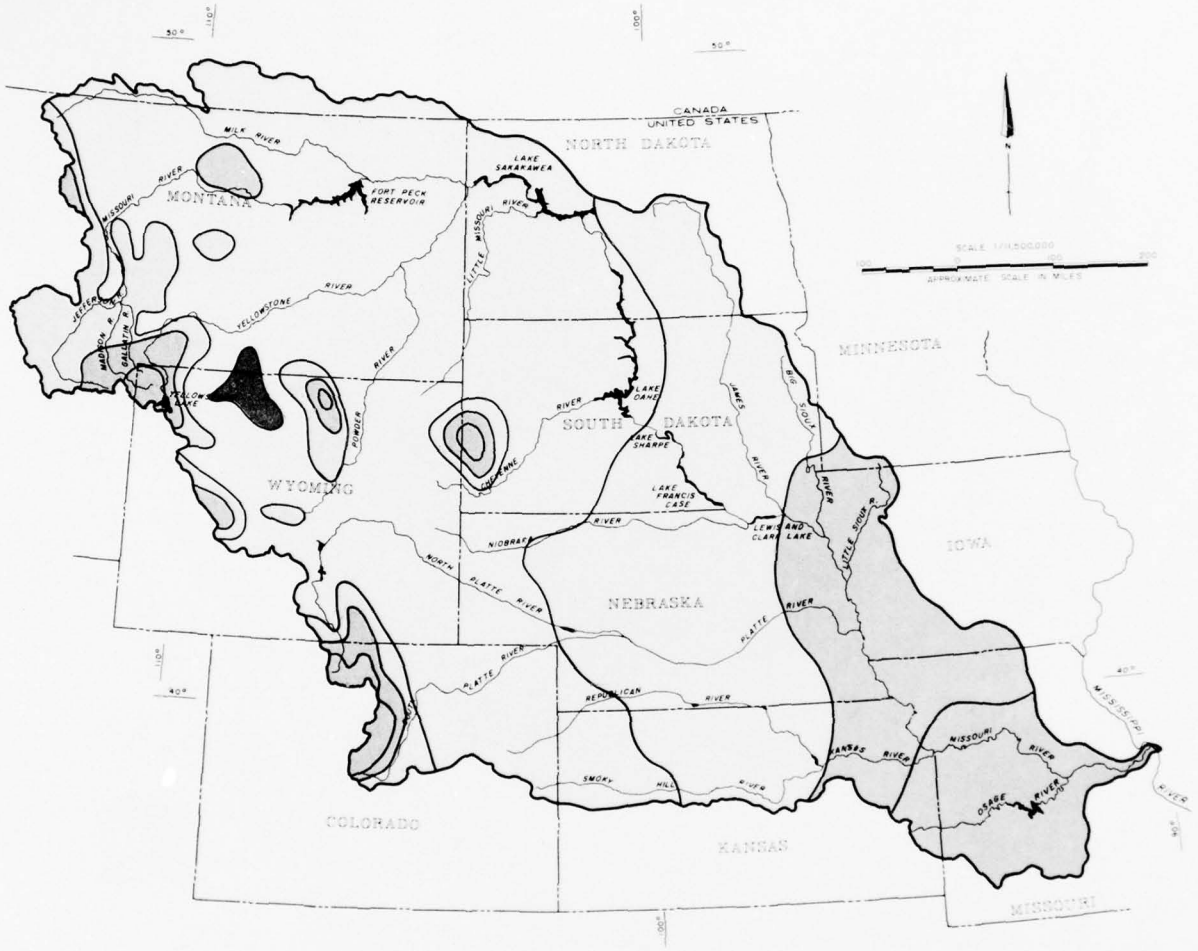
- Loess, Till, and Sandy Prairies
- Central Iowa and Minnesota Till Prairies
- Nebraska and Kansas Loess - Drift Hills
- Iowa and Missouri Deep Loess Hills
- Illinois and Iowa Deep Loess and Drift
- Iowa and Missouri Heavy Till Plain
- Cherokee Prairies
- Central Claypan Areas
- Central Mississippi Valley Wooded Slopes

EAST AND CENTRAL GENERAL FARMING AND FOREST REGION

- Ozark Highland

FIGURE 4

CLIMATIC ZONES
WITH ASSOCIATED NATURAL VEGETATION



LEGEND

CLIMATES	NATURAL VEGETATION — PREDOMINANT	NATURAL VEGETATION — SECONDARY
HUMID	FOREST	TALL GRASS PRAIRIE
MOIST SUBHUMID	TALL GRASS PRAIRIE	FOREST
DRY SUBHUMID	MIXED GRASS PRAIRIE	TALL GRASS PRAIRIE — FOREST
SEMIARID	MIXED GRASS PRAIRIE	SHORT GRASS PRAIRIE
ARID	SALT DESERT SHRUB	SHORT GRASS

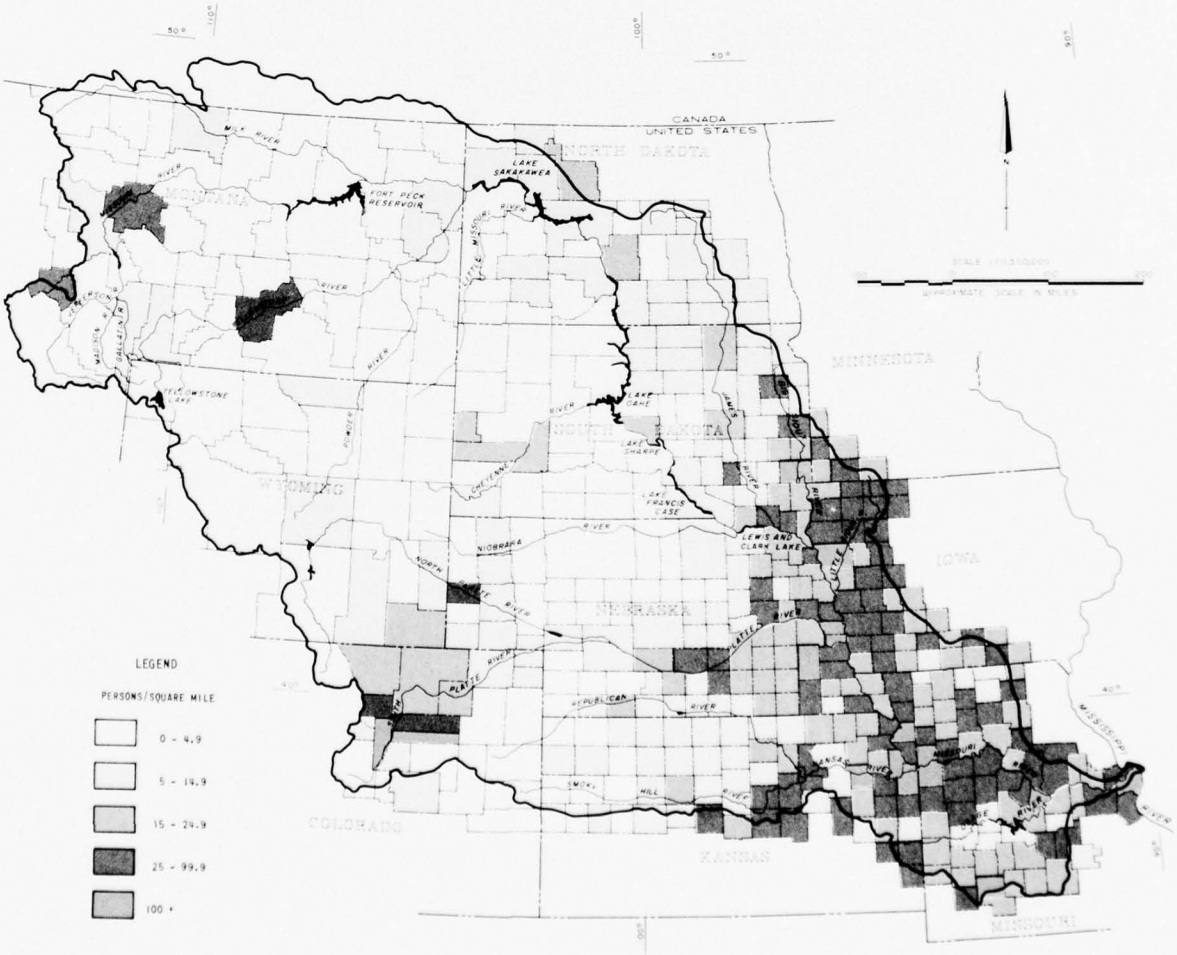
for centuries to be fully as nutritious for livestock, and the region has developed into one of the principal beef-cattle and wool-producing areas of the United States.

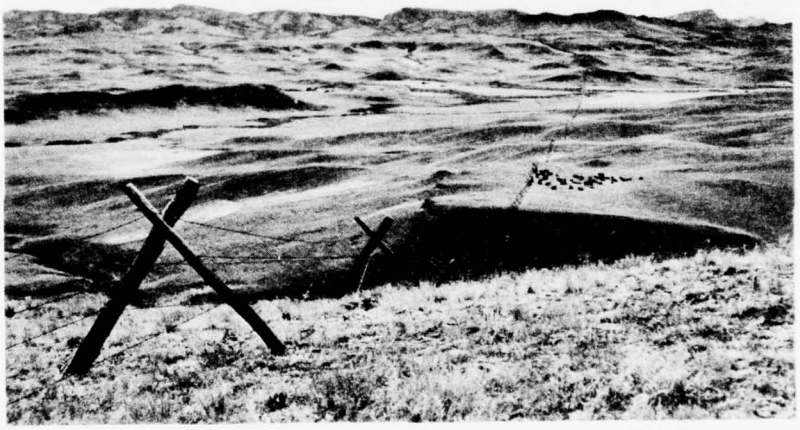
Wheat and other grains have been made more resistant to disease and hybrid corn has pushed the Corn Belt farther north. Especially important has been the continued mechanization of farm operations. Scientific methods and specialized farm equipment have increased production. This trend is clearly evident in the Great Plains where rural population has been declining since 1920.

Agriculture is the dominant economic activity in the basin and population trends have been influenced by changes in agriculture. Agricultural production in the basin is increasing, but efficiency and output per worker is increasing at a faster rate and there has been a decline in the number of farmers and farm workers. Agricultural employment decreased 35 percent and farm population 40 percent between 1940 and 1960. As in the Nation there was a rural to urban movement of people. Manufacturing, other commodity, and noncommodity employment increased about 70 percent between 1940 and 1960, with a 50 percent increase in urban and rural nonfarm population. Per capita annual income and earnings improved between 1940 and 1960, but were only $1829 which was 91 percent of the national average. Overall population growth is lagging behind that of the Nation, reflecting the basin's dependence on a declining agricultural employment, a lesser growth in manufacturing than for the Nation, and a below-national-average per capita income and earnings.

FIGURE 5

POPULATION DENSITY-1960 BY COUNTIES





Livestock on the Range – Western Montana

CHAPTER 2

ABORIGINAL OCCUPATION

We do not know when man first made this sprawling region his home, but we may assume it was before 9000 B.C. At that time, the basin was much different than now, for the land was in the late phases of the last great glaciation.

The early inhabitants – probably immigrants from Asia hunting along the fringes of the glaciers – were faced with gaining a livelihood while exploring a new land. Their hunting economy and limited technology precluded extensive or profound utilization of the basin's rich resources. However, from the archeological record, it is evident that by 7000 B.C. they were aware of those natural resources which could be utilized within the limits of their primitive skills. This utilization – harvesting of animals and wild plants for food and extraction of raw materials for weapons, tools, etc. – was very limited. Throughout the prehistoric era the uses remained basically the same. The only major additions were the use of fertile riverbottom land soils after the advent of corn-agriculture and later systematic exploitation of big game following acquisition of the horse. Throughout most of the early history of human life in the basin, its environment affected man more than he affected the basin.

Viewing the Missouri Basin broadly, we may distinguish five "epochs" in aboriginal occupations, although the time spans are not clearly defined and overlap somewhat. In any given epoch, most aboriginal groups participated in the life-way which typified it; some peoples in parts of the basin lagged, following older life modes. Others, being close to centers of cultural invention, forged ahead to accept new ideas, acts and beliefs, and transmitted these to their more backward neighbors. We may arrange these five epochs chronologically as shown in table 1.

Table 1 – EPOCHS OF ABORIGINAL OCCUPATIONS

Approximate Era	Epoch	Cultural character
Earlier than 9000 B.C. to 500 B.C.	Early hunting	Early immigrants and their descendants. Economy: hunting animals now extinct (mammoth, bison antiquus). Lived in cold, damp climate of terminal Pleistocene. Social groups evidently small (a few cooperative families). Houses probably temporary shelters. Principal weapon the dart and spear-thrower. Distribution probably general throughout the basin. Remains now known in Colorado, Wyoming, South Dakota, Nebraska, Missouri, and Iowa.
4000 B.C. to 500 B.C.	Foragers	Life-way correlated with post-glacial desiccation of landscape and gradual disappearance of Pleistocene big game. Very small nomad groups hunting small game and gathering wild plants. Their life was poorer than that of their predecessors and successors. In western part of basin, this way of life persisted into historic times. Distributed generally through western part of basin as far as Scotts Bluff, Nebraska.
500 B.C. to A.D. 800	Plains Woodland	Small communities along stream valleys sometimes buried dead in earth mounds. Food: agricultural products supplemented by wild plants and such game animals as the deer. Did not exploit the bison effectively; agriculture not as intensive or extensive as that of Sedentary Village Farmers. Discontinuous distribution in eastern part of basin.
A.D. 800-900 to mid-18th century	Sedentary Village Farmers	Permanent houses in fortified villages. Strong community organization; corn-agriculture economy, supplemented by wild-plant produce and seasonal bison hunts. Early, built rectangular houses; later, circular earth lodge. Historic representatives: Mandan, Hidatsa, Arikara (Middle Missouri River Valley), and Pawnee (Central Plains). Omaha Tribe part of this pattern along Missouri River in Iowa, Nebraska, and South Dakota, and the Kansa tribe in Kansas.
1750-1870's	Equestrian	Use of horse to exploit bison as primary food source. Basic social unit the hunting band: a number of related or cooperating families. Annual tribal gathering. War the primary route to prestige and leadership. These territorial nomads included the historic Plains tribes: Sioux, Cheyenne, Crow, Arapaho, Blackfeet. Distributed over the Plains in the Missouri Basin.

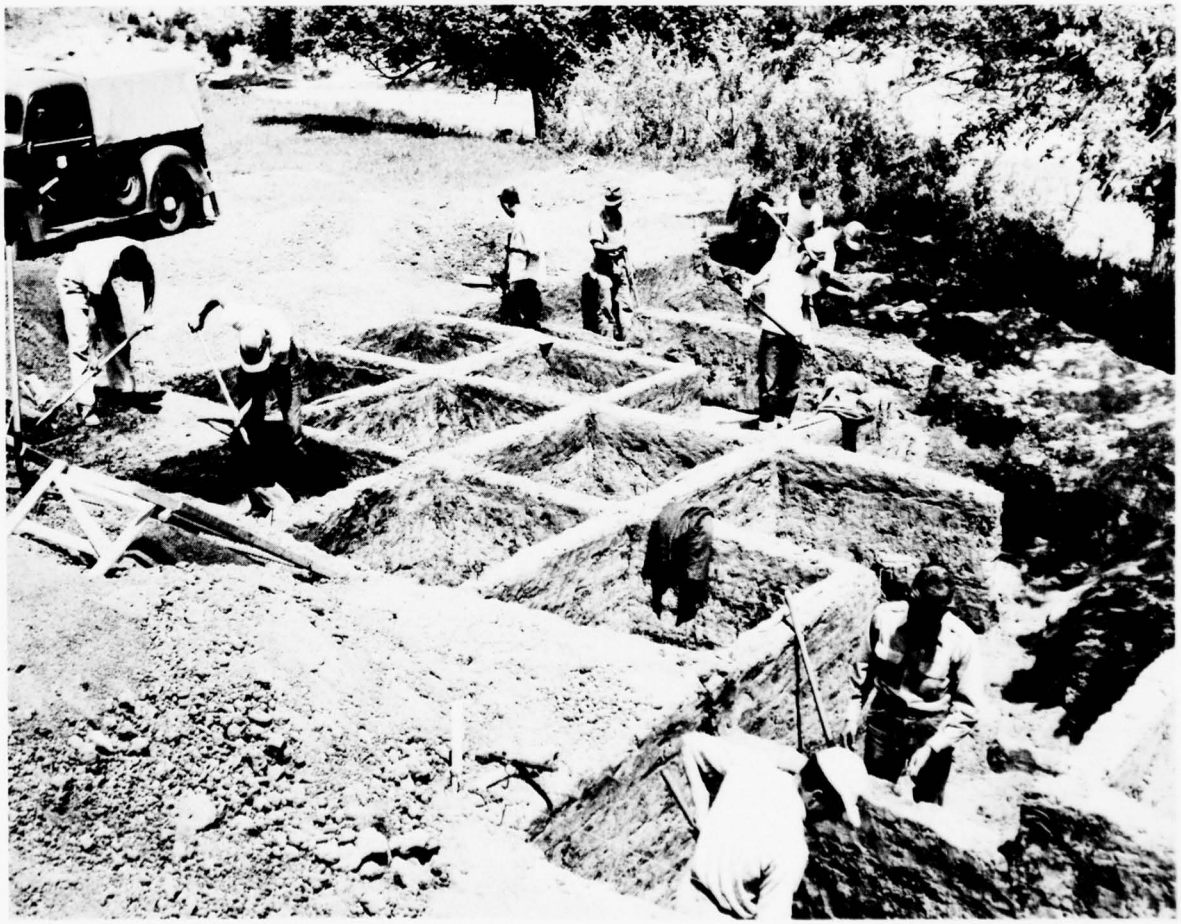
This prehistoric era of the Missouri Basin is characterized throughout by a stone-age technology, thus limiting the ability of aboriginal peoples to exploit the rich natural environment.

The environment, which offered subsistence to the aboriginal people, was affected by climatic conditions, as illustrated by the change from the cold climate of the last glaciation to a more temperate condition, followed by a cycle of progressive "drying up" of the Plains. The latter situation, coupled with the extinction of the large pleistocene game animals, forced the Foragers to depend on smaller game. Also, this compelled adjustments in other phases, such as the size and organization of local populations and changes in tools, weapons, and campsites. At the same time, in the extreme eastern part of the basin, hunters and gatherers lived a richer life, since food was readily available.

Fully utilizing the forests, these people were among the innovators who produced the "Woodland" culture, which they later transmitted to the Plains areas located along the wooded river courses. As their life had been geared to forests, they did not frequent or take advantage of resources on the open plains. It remained for the later Village Farmers to inaugurate use of the bison herds as a wild-game supplement to agricultural foods. However, without the horse, the Village Farmers could not hunt bison as efficiently as did the Equestrian Hunters of the 18th and 19th centuries.

This impact of earlier human cultures on the land was localized and subtle. Village Farmers, for example, no doubt wrought minor ecological changes on the river terraces where they lived and farmed. But more spectacular change occurred later in the Equestrian Hunter "epoch." Introduction of the horse and subsequently firearms for hunting placed at the disposal of the Indian the vast protein supply stored in the meat of the bison herds.

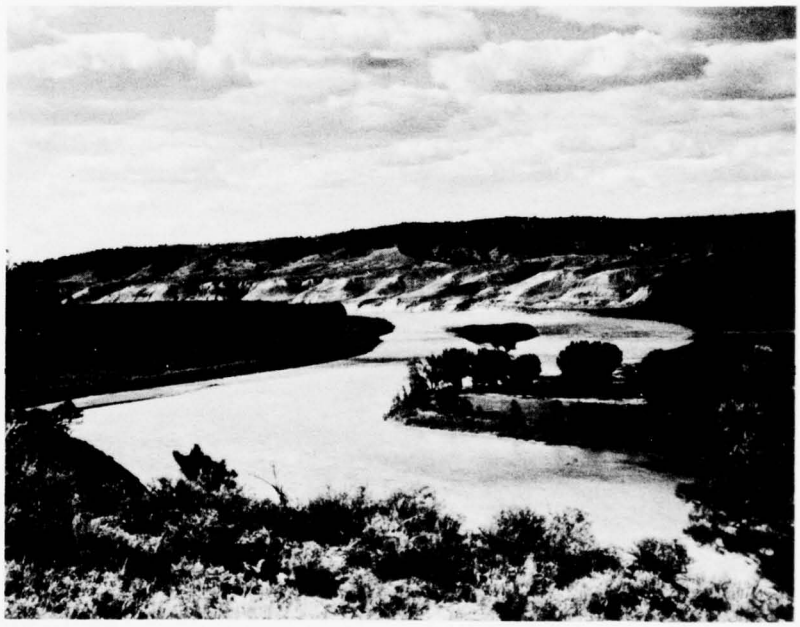
For about a century a whole new way of life flourished in the Missouri Basin, based on these herds. Tribes which had farmed up to that time, forsook their cornfields and permanent villages to live as bison-hunting territorial nomads. The great herds of bison, which had



Archeological Exploration in Fall River County, South Dakota. Similar Explorations Throughout the Basin Furnish Important Clues to the Aboriginal Occupation.

been able to survive Indian subsistence hunting, soon were exterminated by the additional pressure of white commercial hunting. Loss of this economic base and increasing pressure by the whites caused the flamboyant cultural structure of the Equestrian Hunter to collapse. Thus, destruction of the big game herds ended the impact of aboriginal man on the basin and simultaneously ushered in the era of utilization of the basin's natural resources by more technologically advanced men from Europe.

The Indians Hunted The Bison To Sustain Themselves



The Missouri River Valley Near Lewiston, Montana

CHAPTER 3

EUROPEAN OCCUPATION

Most of the North American coastline was well known in Europe by the end of the 1500's. By the first decade of the following century, Europeans had begun their penetration of the interior and competition for the riches it contained. Spain founded St. Augustine, Fla., in 1565 and Santa Fe, New Mexico in 1609. The English established their Jamestown Colony in 1607, and the French settled Quebec in 1608.

The Spaniards, operating from bases in Mexico and later in Santa Fe, were the first to explore the plains and the prairies. As early as 1542, Coronado may actually have reached the southern edge of the Missouri Basin in central Kansas. The Spanish conquistadors, in some respects, were much better suited to exploit the Great Plains than their English and French competitors. Unlike England or France, Spain is an arid country, and the Spaniards were familiar with dryland techniques. For example, they had learned to build with adobe and stone in their own timber-deficient homeland. Their horses were tough wiry breeds from North Africa and Arabia that could subsist on meager nourishment. Furthermore, the Spanish were well aware that, in semiarid country, food and fiber could be obtained more easily through the medium of raising sheep and cattle than directly from the soil.

The conquistadors, however, lacked one important pioneering trait – they would not dirty their hands, even to dig for gold, and they did not bring farmers or manual laborers with them to do the work. Instead, the Spanish superimposed Spain's feudalistic institutions on the agricultural populations which they encountered. When the Spanish reached the Great Plains, they found only the poor village Indians of the prairies, whom they could not work, or the fierce nomadic Indians of the High Plains, who would not stay in one place long enough to be imposed upon.

While the Spaniards searched for gold, and for souls to convert, the Frenchmen sought the fur-bearing animals whose pelts grew rich in the subzero winters of North America's interior. From Quebec, the French vanguard moved toward the Great Lakes and down the Mississippi. In 1673, the Marquette-Joliet expedition floated down the "great river" to the mouth of the Arkansas, followed in the 1680's by La Salle, who reached the Gulf of Mexico.

The French were the first to probe the interior of the Missouri Basin. In 1719, Du Tisne ascended the Missouri River as far as the Grand River, in Missouri. Five years later, Borgmont, in extending Du Tisne's line of march, reached the High Plains in western Kansas. The La Verendrye brothers left their fur-trading post on the Assiniboine River in Canada in 1742 and set out for the Mandan villages in central North Dakota. Leaving the Mandans, they headed southwest, touching near the present western border of South Dakota. From this point, they faced due east and returned to the Missouri River. In 1740, the Mallet brothers ascended the Platte River as far as the Loup River junction, then turned south through Central Kansas and departed from the Missouri Basin. Truteau was the first explorer to ascend the Missouri River for any great distance. In 1794, he reached the Arikara villages at the mouth of the Cheyenne River in central South Dakota.

French fur traders followed in the footsteps of the explorers, and men of French blood dominated the Missouri Basin trade until the Louisiana Purchase in 1803. By that year, the fur trade had been well established among the Prairie Indians, whose villages were scattered north along the Missouri River to the Mandan towns in North Dakota and along the lower courses of the "great river's" tributaries. The fur men no doubt ranged far more extensively through the Missouri Basin than we know, but few recorded their adventures or left a permanent mark upon the land.

So devoted to the fur trade were the French that they neglected the agricultural potential of the lower Missouri. Established in 1764 by fur-trader Pierre Laclede, St. Louis was known in its early days as "Pain Court," meaning "Short of Bread," and furs were used as currency. In 1804, when Lewis and Clark began their epic voyage up the Missouri, the last French outpost was La Charette, 68 miles above the mouth of the river and consisting of seven families. At that time, the St. Louis area itself had a population of 2,780.

At the close of the French era, the Missouri Basin remained sparsely settled at its extreme eastern end, and

public knowledge of the area farther west was limited to the lower reaches of the main river valleys. The systematic exploration and settlement of this vast area began with the American purchase of the Lousiiana Territory.

LaSalle had claimed the whole of the Mississippi River and the land drained by its tributaries for France, and had named the area "La Louisianne" after the reigning king, Louis XIV. France retained Louisiana until 1762. In that year, following defeat by England in the Seven Years War, she ceded the territory to Spain, primarily to keep it out of the hands of the English.

Spain held the Louisiana Territory for 38 years, but sent only a few administrators and soldiers to occupy the region. Thus, Louisiana remained French in population and culture. By 1802, American settlement had moved along the Ohio River Valley and touched the Mississippi. Because the Appalachian Mountains separated the new settlements and the eastern seaboard, westerners depended on river transportation to convey their produce to market.

Corn, flour, grain and salt pork were floated down the Ohio and Mississippi rivers to New Orleans where the cargoes were unloaded and stored for transshipment. In 1802 the Spanish Intendant at New Orleans refused the unloading of American freight. The reasons for this action are not clear. A secret treaty had transferred the whole of the Louisiana Territory back to France in 1800. The decree closing the port to Americans may have originated with Napoleon. In any case, President Jefferson knew that he could not allow the economy of half the Nation to remain at the mercy of a foreign power. Accordingly, the cession to France now revealed, Jefferson sent James Monroe to Paris to join the American foreign minister in negotiating the purchase of New Orleans. Much to the Americans' surprise, Napoleon offered to sell France's claim to the entire Louisiana Territory for only $15 million.

The Louisiana Purchase, officially completed on May 9, 1803, was among the significant events of world history. With minor exceptions, the eastern boundary of the Louisiana Territory was the Mississippi River, the western boundary the Rocky Mountains, and the southern boundary the Red River and the present State of Louisiana. "Louisiana" constituted the entire western drainage area of the "Father of Waters," and the greater part of this area was the Missouri Basin. The purchase doubled the size of the United States, added incalculably to the Nation's wealth, and made it almost inevitable that Americans would advance to the Pacific. In short, the Louisiana Purchase projected the Unites States as a great power and made possible the successive waves of exploration and settlement within the Missouri River Basin.

First Cavalry at Fort Custer, Montana – 1887

CHAPTER

EARLY AMERICAN FRONTIER AND SETTLEMEN

When title to the vast Louisiana Territory was delivered to the infant Republic of the United States, very little was known about the 880,000 square miles of mountains, plains, and rivers. For the most part, the westward migration of Americans had been stymied at the banks of the Mississippi and Missouri rivers, for the French and Spanish did not look favorably upon upstart Americans moving into their territories and exploiting the resources.

In geography, people, and resources, the Missouri Basin was an enormously diversified area. Within its confines or bordering on the basin, were the Rocky Mountain Chain, with its spectacular landscape, hundreds of beaver streams, and timbered feeding grounds of the grizzly; the valley of the Arkansas, coming down through antelope meadows to touch the Cimarron Desert; and Red River Valley leading into the lush lower Mississippi lowlands; the northern lake country; and the grotesque Dakota Badlands. In its heart were the Great Plains and the Black Hills. The whole area was made accessible by the Missouri River and its tributaries.

During the first half of the 19th century, a number of explorers and observers traveled over parts of the basin and reported on its varied characteristics. The most important were, of course, Lewis and Clark, and others included John Bradbury, Henry M. Brackenridge, George Catlin, Prince Maximilian, Francis Parkman, Stephen Long, Capt. John C. Fremont, Lt. Zebulon Pike, John J. Audubon, Father Pierre Jean DeSmet, Lt. G. K. Warren, Capt. William F. Raynolds, and Dr. Ferdinand V. Hayden (figure 6).

> President Jefferson instructed Lewis and Clark to — ". . . explore the Missouri River, and such principal streams of it, as, by its course and communication with the water of the Pacific Ocean may offer the most direct and practicable water communication across this continent for the purpose of commerce."

They were told also to record everything of importance or interest they might encounter along the way. A 45-man Corps of Discovery left Wood River, Ill., near St. Louis, Mo., in May 1804. The explorers passed the following winter with the friendly Mandans, and, in April, with 30 of the original party, they continued ascend the unknown river. In August, the expedit reached a point on the Jefferson River, a branch of Missouri, where it had to abandon boat travel. From t point, with horses purchased from the Shoshones, th crossed the Continental Divide, and in November expedition reached the shores of the Pacific Ocean. T expedition built Fort Clatsop for shelter during winter and then departed in March on their ret journey. The Corps of Discovery stepped onto riverbank at St. Louis on September 23, 1806, amid crowd of rejoicing citizens.

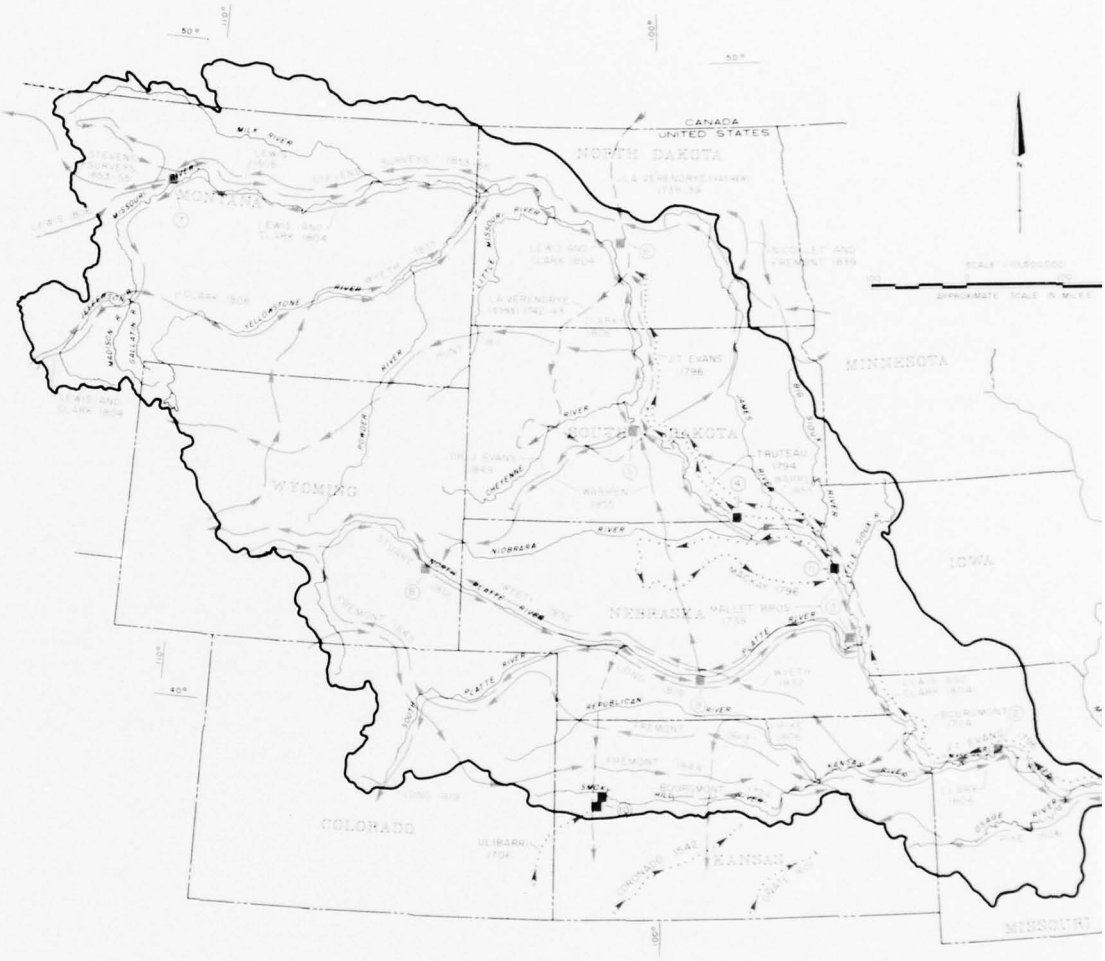
Lewis and Clark brought back their daily journ filled with copious notes on flora, fauna, clima topography, and the Indians. Among their many coveries they found the Shining Mountains or Rockies be a formidable barrier, and that a water passage to Pacific did not exist. In addition, they establish friendly relations with most of the Indian tribes th met and strengthened the United States' claims to Oregon country.

In July 1806, while Lewis and Clark were descend the Missouri on their return voyage, Lt. Zebulon Pike out from St. Louis with orders to explore the source the Red and Arkansas rivers, to make peace between warring Kansa and Osage Indians, and to win friendship of the other Plains tribes. With 23 men, I paddled up the Missouri and Osage rivers to the Os villages near the present Missouri-Kansas border. He th traveled northwest to the Republican River and follow its course to a point just above the Kansas-Nebra border, then south to the Arkansas River and up t river to its source near Pike's Peak.

Pike tried but failed to reach the summit of mountain that now bears his name. From Pike's Pe the party marched south into Spanish territory wher was captured by a troop of Spanish cavalry. Pike taken to Chihuahua, Mexico, where he was held questioned, then finally released to American authori at the Louisiana border on July 1, 1807. Pike retur with reliable geographic data on the land he pas through, but mislabeled the prairies and plains a des thus originating the myth that this vast region was u for white settlement.

FIGURE 6

PRINCIPAL EXPLORATIONS



LEGEND

FRENCH

SPANISH

AMERICAN

In 1820 Major Stephen H. Long led a party up the Platte River to central Colorado. Near Pike's Peak the party split up and three members ascended to the summit. One group followed the Arkansas River eastward and the other the Canadian River, which runs generally south and east through the present states of Texas and Oklahoma. The expedition was reunited at Fort Smith, Ark. Long added valuable inform the knowledge of the Louisiana Purchase, b significantly, he confirmed Pike's observation Great Plains was the Great American Desert.

The colorful John C. Fremont made severa tions into the Far West between 1842 and 185 included his journey of 1845 to the Mexican pr

California, which involved him in the Bear Flag Revolt, converting that province into a republic. His greatest trek, in 1843-44, took him to Fort Vancouver in the Oregon country, south through California's Central Valley, and thence east to his starting point at the mouth of the Kansas River.

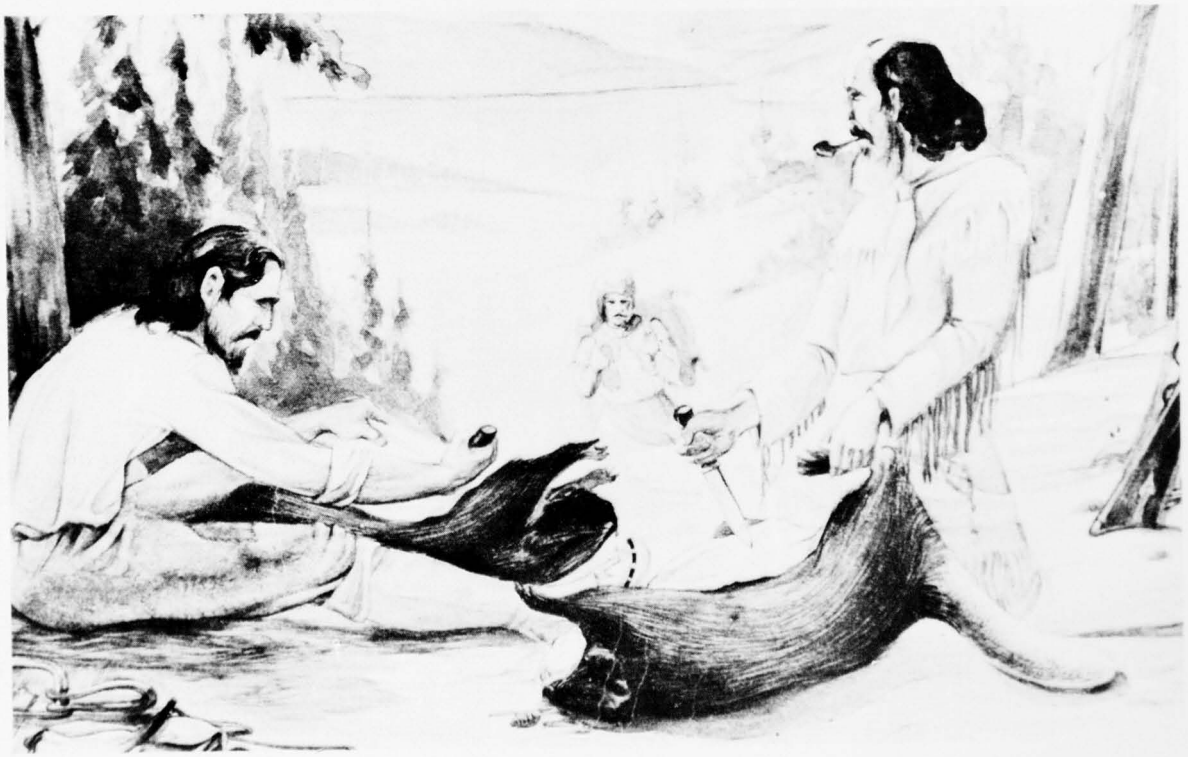
Fremont was more a path marker than a path finder. Most of the land he traversed had been seen by others, but he had no equal as a popularizer. His adventures stirred the public's imagination and greatly stimulated migrations to the West Coast. He contributed nothing of great original significance to western knowledge, but his comprehensive, detailed, and accurate maps were the best of the decade.

Beginning in 1853, the Federal Government launched a series of surveys to the West Coast to locate the best route for a transcontinental railroad. Three of these surveys passed through the Missouri Basin. One of the proposed routes began at Sauk Rapids on the Mississippi River, struck northwest of the bend of the Missouri, then followed that river to the Rockies. Another route traced the Oregon Trail. The third ran along the Kansas and Arkansas rivers to Cochetopa Pass in the southern Rockies.

Sectional controversy prevented the building of a Pacific railroad before the Civil War, and none of the five routes surveyed was ever utilized in its entirety. However, the surveys added greatly to the knowledge of the West. The fruits of this work were published in 12 generous and beautifully illustrated volumes. Included was the latest information on the Indian habitation, topography, geology, botany, animals, birds, and reptiles of the regions traversed.

Government explorations in the latter half of the 19th century consisted of filling in the scattered blanks left by previous expeditions. Most significant in the Missouri Basin was Dr. F. V. Hayden's 1871 survey of the Yellowstone region, which laid the foundations for the country's first national park.

Fur traders operating out of St. Louis played an important role as the advance guard of settlement. In 1807, John Colter, believed to be one of the first white men to enter the area, noted the thermal wonders of the present Yellowstone National Park. In 1813, Robert Stuart of Astor's Pacific Fur Company, discovered the overland route which became the Oregon Trail. After the War of 1812, fur traders extended their operations on the Upper Missouri. Beginning in 1823, when travel on the river was blocked by the Arikara Indians, the traders shifted their activities to the Rocky Mountain region. The beaver trade, which flourished until 1840, was dominated by the American Fur Company.



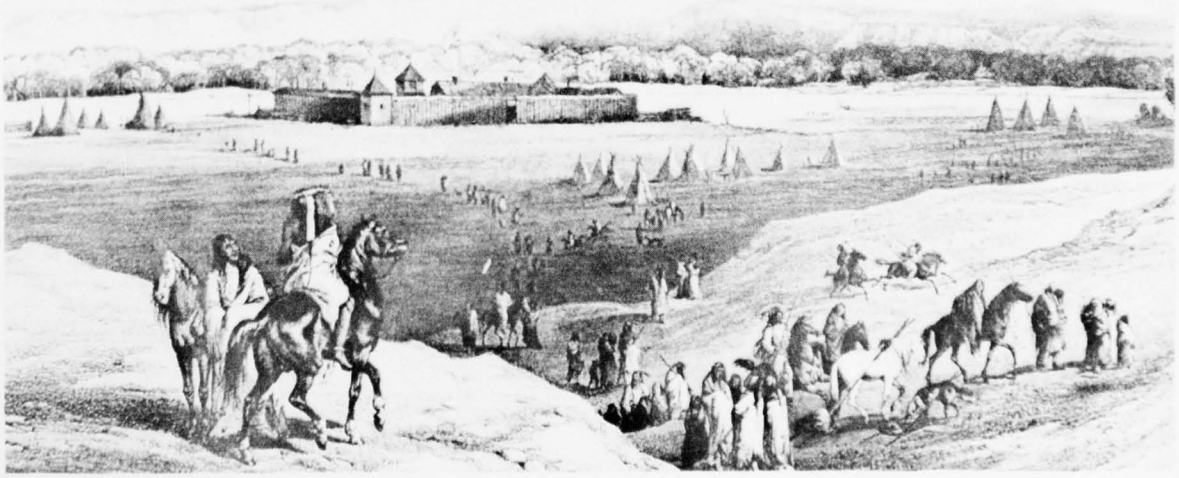
Fur Trappers, Calling Themselves "Mountain Men" Were the First White Men to Utilize the Resources of the Basin. They Traveled Throughout the Basin and Contributed Valuable Information about the Geography, Resources and Indian Occupants.

These fur traders seemed to be more at home in the forest solitudes than in the company of their fellow man. Their life was a rugged one, and only men of strength, intelligence, determination, courage, sharpened senses, and good instincts survived. They adapted themselves to the ways of the natives, borrowing their clothes, their living habits, their forest lore, and in some cases, their wives.

Hardy, resolute, self-confident, far-ranging human beings, calling themselves "mountain men," these trappers and traders did much to prepare the way for those to follow. They provided some tribes with guns which led to the slaughter of their wilderness enemies. Mountain men like Old Bill Williams, Jim Bridger, the Sublettes, Tom Fitzpatrick, Joe Meek, Andrew Henry, Kit Carson, and a score of others explored the West, seeking out passes through mountain barriers, investigating river routes to the interior, and discovering favorable agricultural sites. Permanent trading posts like Forts Pierre, Clark, and Union on the Upper Missouri; Fort Laramie, where plains and mountains met; and Bent's Fort on the Upper Arkansas achieved frontier fame.

Navigation by steamboats on the Missouri River began in 1819, the furthest point reached during that year being the site of Council Bluffs, Ia. During the next 10 years many steamboats plied the Missouri River. These boats were owned by the individual fur-trading companies and carried only their own merchandise. In 1829 the first steamboat for transporting freight, for anyone who could pay the price, was inaugurated by Packett W. D. Duncan. It was a short line compared to those of later years, running only between St. Louis, Mo., and Fort Leavenworth, but it was a beginning. The fur-trading business continued to dominate the river traffic until 1845, the start of significant western migration. However, to most of the migrants, the basin was just an area to cross on their way to the West Coast, and few stayed to settle during this period.

Settlers and gold seekers advanced westward. The Santa Fe Trail, which began at Franklin, Mo., was opened in the 1820's. Capt. B. L. E. Bonneville took the first covered wagons across the Continental Divide in 1832. The first great migration to Oregon country occurred in 1843. In 1847 Brigham Young led the Mormons to the Great Salt Lake of Utah, and in 1848



Fort Union, American Fur Company Trading Post at the Mouth of the Yellowstone River 1833. These Early Day Trading Posts were Important Centers of Trade, Bulwarks of Protection, and a Link to the Eastern Centers of Commerce

the historic California Gold Rush began. These mass migrations were stimulated by the opening of vast new territories which resulted from the war with Mexico and by the settlement of the Oregon dispute with Great Britain.

After the day of the fur traders came the cattlemen. They drove their herds up the Chisholm and other trails from Texas where the longhorns had multiplied during the Civil War. Boisterous cowtowns sprang up at the railheads to serve the trail herds and cattlemen. Like the fur traders, the cattlemen adapted themselves transitionally to the land. Moving from place to place, staying only long enough to allow their herds to devour the lush

Cattle Drives Were A Common Sight on the Great Plains

Central City, Colorado in 1867 was Typical of Many of the Early Rocky Mountain Gold and Silver Mining Towns

grasses, the cattlemen's technological innovations were meager.

Settlement along the western edge of the basin was started by the miners. However, their frontier depended on the exploitation of rare pockets of mineral wealth, and advanced in less orderly fashion than that of the fur traders or cattlemen. In 1858, on the present site of Denver, gold was discovered where Cherry Creek enters the South Platte River. Shouting "Pike's Peak or Bust," people swarmed into the region and spread out into the Rocky Mountains where they literally threw together a scattering of rakish mining camps. The miner was definitely a distinct frontier type — ready to rush wherever opportunity beckoned. Like the fur traders and early cattlemen, he skimmed off the visible wealth and moved on, leaving the rich land to settlement by others.

During the 1850's, settlers began to occupy what is now eastern Kansas and Nebraska, thus leading to the eventual confinement of the Plains Indians. Settlers and immigrants as well as professional hunters and sportsmen took a heavy toll of buffalo and other wildlife on which the nomadic tribes depended for food. The Indians offered increasing resistance as the vital supply of game declined.

To bring an end to the conflict with Indians, the Government, in 1868, at Fort Laramie, Wyo., induced about one-half of the Sioux and Cheyenne tribes to sign a treaty. By its terms, they were given the western half of present South Dakota for a permanent reservation, with hunting rights extending to the Bighorn Mountains of Wyoming. The United States Government agreed "to protect the . . . Indian nations against the commission of all depredations by people of the United States . . ." Similar treaties had been signed with Southern Plains tribes at Medicine Lodge, Kans. in 1867.

In less than 6 years after the treaty was signed, Lt. Col. George A. Custer led the 7th U. S. Cavalry Regiment on an official reconnaissance expedition into the Black Hills, the heart of the Indian reservation. Prospectors who accompanied Custer found gold in the Hills. When the news spread, hordes of gold seekers invaded the region.

The Indians saw that their treaty rights meant nothing to these men. They watched the unsuccessful efforts of the Government to halt the stream of miners coming into the Indian lands. Further, they saw that even when the Army evicted hundreds of miners, thousands more came to fill their places.

The Indians became more and more hostile and, in anticipation of an outbreak, the Indian Commissioner issued an ultimatum to the Indians in December 1875 ordering them to return to their reservations before January 31, 1876. Weather conditions prevented the peaceful Indians from complying with these orders, and the more hostile group made no attempt to obey. The Secretary of the Interior, administering Indian affairs, then called upon the War Department to enforce the order.

The climax came on two hot days in June 1876 in the valley of the Little Bighorn River in Montana. In the Battle of the Little Bighorn, 261 soldiers and attached personnel of the United States Army lost their lives. The Indians won this battle, but lost the war against the white man who gradually stopped their nomadic way of life.

Confinement of the Indians left the rich land open to settlement by the pioneer farmer. Unlike his predecessors who were concerned primarily with exploitation of the visible resources, the farmer viewed the forest and grasslands as a resource to be developed and made productive. He realized that the early meager yields did not indicate the true potential of the rich prairie soil, and he gambled that more intensive methods of cultivation would produce bountiful crops.

A principal initial obstacle to easy cultivation was the tough prairie sod, made up of the matted root systems of the grasses. To the eastern eye, the stretches of treeless grasslands looked like a plowman's paradise, but that view oversimplified the facts of cultivation problems. Lightweight plows which had been quite adequate for the soils of New England or the wooded country of the east broke in the tough, resistant prairie sod. In time, special sodbreaking plows were developed to handle the prairie work.

Many pioneer farmers were motivated by a restlessness and a search for an easier and independent way of life. A certain segment was constantly moving with the advancing frontier, never finding its dreamed-of Utopia. Others were sturdy and industrious and, once settled, were determined to make a success in their new environment. All hoped to transform the western wilds into replicas of the eastern or foreign communities from which they came.

The end of the Civil War in 1865 released thousands of men to seek a livelihood in a country disrupted by 4 years of upheaval. Many took advantage of the public lands offered by the Homestead Act. A homestead, added to the other opportunities held forth by a democratic nation, lured many Europeans to seek new homes in America. Thus, they and their descendants were to take an active part in the political life of the country which they helped develop.

FIGURE 7

BOUNDARIES OF TERRITORIES AND STATES-1859

This Encampment Was Typical of The Nomadic Existence of Plains Indians

The Indians Depended on the Buffalo for Food and Shelter

CHAPTER 5

LAST FRONTIER AND SETTLEMENT (1860-1900)

Settlement of the basin continued at a rapid rate between 1860 and 1900. In addition to migration from the eastern United States, European immigrants came directly to the basin during this period which coincided with the open-door policy prevalent at that time. These people tended to settle in clusters, so even today nationality groups prevail in certain areas. Predominant among the nationalities that came were the Germans, Russians, Norwegians, Swedes, Czechs, Italians, and the English, in about that numerical order. In addition there were several other nationalities but their numbers were relatively small. With settlement and growth in population, the changeover came progressively from territorial status to requests for and admissions as States of the Union. As a result of their eastern location and early settlement, Missouri, Iowa, and Minnesota had already achieved statehood, with boundaries placing them partially within the Missouri River Basin. All of the Missouri River Basin States were admitted to the Union by 1890, as shown:

State	*Order of Admission*	*Date of Admission*
Missouri	24th	August 10, 1821
Iowa	29th	December 28, 1846
Minnesota	32nd	May 11, 1858
Kansas	34th	January 29, 1861
Nebraska	37th	March 1, 1867
Colorado	38th	August 1, 1876
North Dakota	39th or 40th	November 2, 1889
South Dakota	39th or 40th	November 2, 1889
Montana	41st	November 8, 1889
Wyoming	44th	July 10, 1890

Agitation for obtaining public land through a homestead act coincided with the rising tide of abolitionism just before the Civil War and the move to prevent the spread of slavery to the territories. Some Northern Congressmen supported the homestead movement in an attempt to offset the power of the South and not because they were enthusiastic about giving free lands to settlers. The South, with its immobile system of labor, knew it could not compete with the North in settling the West. A populated West would give the North a preponderance of voting power. The South's problems would then receive less consideration in the Halls of Congress.

With the Civil War ended and Southern opposition eliminated, nowhere was the tremendous postwar surge more evident than in the Missouri River Basin. It was then that the westward movement overspread the region between central Kansas and the Sierra Nevada, and the final settlers' frontier passed into history. The free-range cattle industry, which sprang up in the 1870's, diminished with the settlement of most of the great free-grass corridor extending between the Missouri River and the Rocky Mountains.

Before the railways and telegraph lines appeared in the West, the Government gave aid to transportation and communications in the form of mail contracts. Among the most notable mail carriers were the stage lines operated by Russell, Majors, and Waddell, later sold to Wells Fargo, which followed the Oregon Trail across the Missouri Basin. Another was the Pony Express which, in 1860, made a record run of 6 days between Fort Kearney, Nebr., and Fort Churchill, Nev., carrying the news of Lincoln's election.

Fort Benton, Mont., the uppermost limit of early navigation, was not reached until 1860, but the steamboat traffic increased. More and more, boats traveled the entire length of the river. From 1860-1864, there were only 6 steamboat arrivals at Fort Benton, but in 1867 alone there were over seventy arrivals. Freight rates to Fort Benton were 18 cents a pound, and fare for a cabin passenger was $300. Many boat owners reported that one trip would pay all expenses, with enough profit to pay the first cost of the boat. The largest single item of operating expense was the salary of the pilot. Those men with special skills were called mountain pilots, and often were paid $1,000-$1,500 per trip.

The steamboat boom reached its peak about 1880, though the transcontinental railroad was completed in 1869. Upon completion of the railroad to Fort Benton in 1887, navigation dwindled and finally disappeared altogether, the last arrival of a merchant boat at Fort Benton being about 1890. Though the steamboat business was profitable, it also was risky, for the river took its toll. During the time when steamboat traffic

was at its greatest, in one year alone over 300 steamboats were sunk. The Missouri River became known as the "graveyard of steamboats." The Corps of Engineers has been involved in improving the Missouri River since 1824 by removal of snags to prevent the loss not only of property but of numerous lives. Each year one or two snag boats worked the river for the 2- or 3-month summer season. During this time, thousands of snags were removed and those that could not be pulled were demolished by explosives.

During the Civil War, Congress chartered the Union Pacific Railroad to move westward across the Great Plains from an initial point on the 100th Meridian in Nebraska to an unspecified junction with the Central Pacific Railroad, chartered in California to construct eastward from the San Francisco Bay area. The Federal Government gave both railroads generous land grants and loaned them, in the form of Government bonds, $16,000 to $48,000 a mile — depending on the difficulty of the terrain. On May 10, 1869, the project was completed, when the two lines met at Promontory Point, Utah. A telegraph wire was attached to the rails so that the blows driving the last spikes were recorded and heard from coast to coast.

Extensive areas of lodgepole pine timber in the basin suitable for railroad ties were a boon to the Union Pacific Railroad in its construction of the first transcontinental railroad in 1867-1869. During the next several decades, as railroads fanned out over the basin, "tiehacks" hewed millions of ties from the basin's forests for the construction of railroads. Fence posts, lumber, fuel wood, and coal were among the first products shipped eastward by railroads to settlers on the treeless plains.

The early settler relied on water transportation for trade with the outside world. Prior to the railroad, overland transportation was quite slow and unreliable, so that much of the early traffic was by river boat. However, with the coming of the railroads, all of this changed. Their lines stretched across boundless miles of open prairies, bringing the city with its markets and shops within hours and days of the back-country farmer rather than weeks and months, as before. Thus, the railroad played a major role in encouraging and making further settlement possible. Later, and before the turn of the century, the western farmer came to consider the railroad as a bitter enemy, but in the early days he looked on it as an indispensable friend in opening up the wilderness.

For the first eight decades of United States history, the Congress refused to accept the colonial precedent of donating land free to all settlers. Statistics show that land sales never brought in more than 10 percent of Government income except for the boom years in 1836 and 1837, but a large segment of the public still believed that revenue from public lands was necessary for the financial stability of the Government.

The earliest important supporter of the homestead idea was Senator Thomas Hart Benton of Missouri. In 1825, he made a motion in the Senate to instruct the Committee on Public Lands to make an inquiry into the expediency of donating land to the settlers. He insisted that the original colonial settlements had been made on terms of free land to settlers and that a policy of deriving revenue from the public lands was reactionary.

Special and limited land-grant acts were passed by the Congress from 1842 to 1853 whereby donations were made to settlers who were enduring special dangers and hardships of the frontier. After 1840, homestead bills were introduced by congressmen from Kentucky, Alabama, New York, South Carolina, Illinois, and Tennessee. The free-land movement was originally nonpartisan, but in 1848 it became a distinct party issue involved with slavery, the outstanding political issue of the time. Sane discussion of the land question often was obscured by the slavery struggle.

In 1860, the House and Senate reached agreement and adopted homestead legislation, but President Buchanan vetoed the bill because he doubted the authority of the Congress to give away land to individuals or states. Finally, the Congress adopted the Homestead Act and it was signed into law on May 20, 1862, by President Lincoln. He had held earlier that he was in favor of cutting up the Government lands in parcels so "every poor man could have a home."

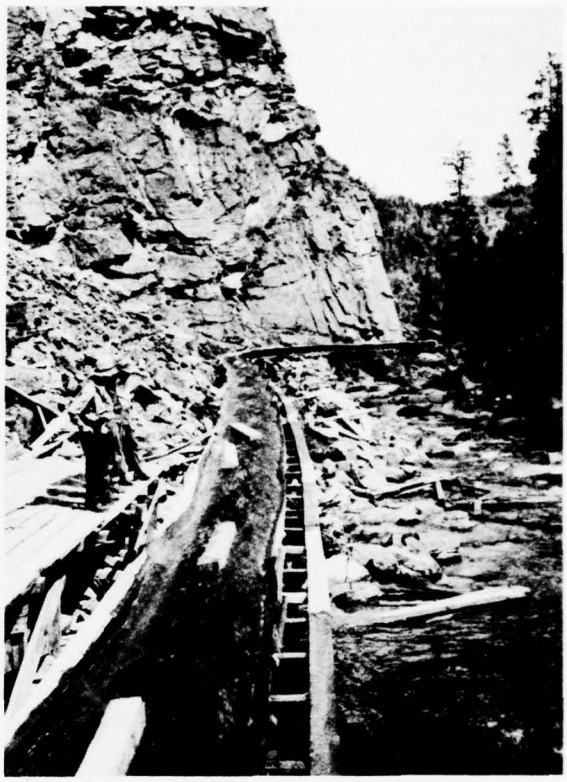
The Homestead Act made it possible for settlers to acquire farms of 160 acres for a nominal fee. To become a full owner, the settler was required to live on the land and cultivate it for 5 years. Later acts made land even easier to get, especially for Army and Navy veterans.

As settlement progressed westward into the increasingly arid land, the Congress became more and more aware that a quarter section was not always an adequate farm unit. Some of the changes advocated were obviously the result of selfish interest, but many of them were based on a realistic appraisal of the agricultural situation in the western United States, particularly in the Missouri River Basin.

The most obvious fault in the initial Homestead Act was the inadequacy of the acreage given the homesteader. This deficiency was not corrected directly until 1904, but by taking advantage of related laws, the homesteader could increase his holdings by more-or-less honorable means. Such laws were the Timber Culture Act, passed in 1873; the Desert Land Act, approved in 1877; and the Timber and Stone Act of 1878. Until 1891, when the Pre-emption Act of 1841 was repealed, the homesteader could file also on a quarter section of land under that law.

It was not until the turn of the century that the adverse effects of acreage limitations on the western

A "Tie Hack" Hewing Railroad Ties From Lodgepole Pine in the Medicine Bow Mountains, Wyoming.



Railroad Ties Were Floated From the Forests by Flume.

Ties Were Decked on River Banks During the Winter, and Floated Downstream in the Spring

A Tie Drive on the Wind River in Wyoming.

homesteader were recognized. The Kincaid Act of 1904 made it possible for settlers in certain counties in western Nebraska to file on a full 640-acre section of land. While still inadequate for ranching, this acreage was more realistic than the quarter section allowed under the Homestead Act. About the same time, the Reclamation Act of 1902 was passed, which permitted the settler to homestead on property irrigated by Government reclamation projects if he would bear part of the project construction costs.

In 1906, the Forest Homestead Act permitted homesteading on a small scale of 160-acre tracts in national forests. In 1909, the Enlarged Homestead Act was passed, which made it possible to file on a 320-acre homestead in nine different states and territories in the West. In 1912, the residence requirement on homesteads was shortened to 3 years, thus making it easier to acquire a homestead. Finally, in 1916, the Stock Raising Homestead Act was passed, providing for 640-acre homesteads on land that had been classified for stock raising.

In general, the homestead era ended about 1920, with a few homesteads being filed on as late as 1935 when President Roosevelt temporarily withdrew all such public lands subject to classification for private entry. Actually the Homestead Act and other land settlement laws are still part of the Federal Statutes, but currently they have limited practical value due to the small amount of economically manageable agricultural land remaining in public ownership.

Following their eastern heritage, the first settlers on the prairies of the Missouri Basin staked their claims on the rich bottom lands along the rivers where both water and timber were plentiful. For these first arrivals, the pioneer experience did not differ greatly from that in the eastern part of the country. The settler cleared his land, using felled trees to build a rail fence and to construct and warm his home. His dwelling was the familiar log cabin, usually comprising one room about 12 by 16 feet. Nails were expensive and scarce, so hardwood pegs in augerbored holes were used wherever necessary.

The more primitive cabins lacked windows, had dirt floors, and in lieu of a door the owner closed the entrance with a piece of carpet or buffalo skin. Puncheon floors of crudely split logs, together with greased paper windows and wooden doors hung on hide hinges, were found in the better dwellings. The best timbered areas soon were occupied, and later arrivals were likely to find only crooked trunks and branches with which to build. Especially for homes built of such materials, the spaces between the logs were chinked with mud and twigs, which were likely to fall out, permitting wind, dust, rain, and snow to enter. If the settler became wealthy enough and if a sawmill was established in the neighborhood, the log cabin might be replaced with a frame house. However, as late as 1860, the owner of such a dwelling ran the risk of being looked upon as "high-toned."

For the river bottom settler the most important crop, as it had been in the East, was corn. There were oxen to pull his plow and a cow or two for milk, together with a few pigs which either shared the corn or were allowed to root in the woods for nuts.

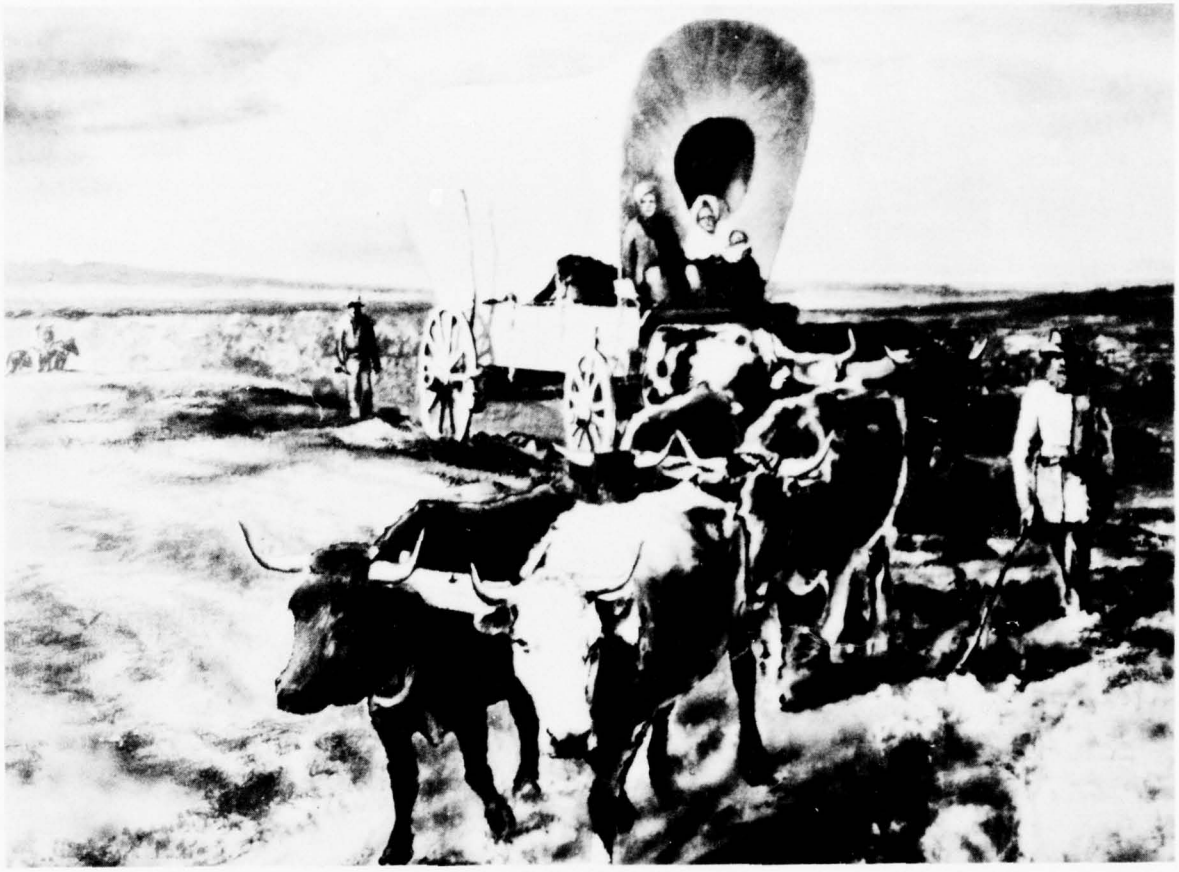
By 1840, the choice wooded areas along the streams in the areas open for settlement had been occupied. The American pioneer finally entered upon the treeless prairies. In his contemplation, he considered the soils of the region rich and the rainfall and growing seasons right for bountiful crops. Furthermore, he could avoid the grueling labor of clearing the land, but without timber what would he burn for fuel and of what materials would he build his house? Aside from these practical considerations, the open, undulating prairies often produced a psychological uneasiness that one observer described in the following manner —

> "You look on, on, on, out into space, out almost beyond time itself. You see nothing but the rise and swell of land and grass, and then more grass — the monotonous, endless prairie! A stranger traveling on the prairie would get his hopes up expecting to see something different on making the next rise. To him the disappointment and monotony were terrible. 'He's got loneliness,' we would say of such a man."

The settler's first response to this challenge of the prairie was to postpone its occupancy as long as possible. Instead, he would, and did, jump across the prairies, plains, mountains, and deserts to the lush wooded areas of the northern Pacific Coast, which were akin to the forests and valleys he had known in the East. Thus began the great covered-wagon migration along the Oregon Trail.

A thin migration of settlers and pioneering missionaries began in the late 1830's, followed by a heavier migration in the mid-1840's. For years, a stream of migrants journeyed along the Oregon Trail in their white-topped wagons, despite the hazards of floods, desert dust, quagmire, marauding Indians, and disease that laid thousands in trailside graves. The westward migration boom really got underway after the discovery of gold in California in 1848. In the following two decades, more than 150,000 men, women, and children made the trek across the Great Plains westward to California and Oregon.

The tales told by the Oregon emigrants of their hardships in the Great Plains region were not encouraging to the frontier farmer who stopped along the way, but, at the same time, they helped ease some of the fear of that little-known region. This treeless belt did not



The Early Settlers Migrated Into and Across the Basin in Their White-Topped Wagons.

prove quite the barren desert that some earlier observers had described it to be. Other factors began to appear that encouraged farmers to remain on the prairies. These included the stimulation and development of transportation, the Homestead Act, and the formulation of the Kansas and Nebraska Territories in 1854, with attendant Indian removal. But the chief impetus to settlement of the open prairies was simply that these areas were now the only agricultural lands left for occupancy.

A most unique problem that faced the grassland pioneer was shelter. The only abundant building material on the prairie was the soil itself, so from this the farmer built his sod house or dugout. A dugout was the more primitive of the two and was likely to be used only as a temporary abode.

The settler carved his dugout from the side of a ravine or hill, leaving the top exposed. He then roofed the excavation with four layers of material. First was a foundation of logs covered with brush, then a grass mat thick enough to hold dirt, and finally a layer of dirt was placed on top of the grass. The front of the dugout was walled in with blocks of sod, or logs if available. A few pieces of wood were set aside to make a door frame in front and possibly a window. Door and window openings were covered with skins, blankets, or carpet fragments. A final feature was a stovepipe driven through the roof. The roof, never completely waterproof, was the weakest element. Should livestock tramp across it, the occupants below would be showered with dirt. A dugout's greatest virtue was its economy, with the total cash construction cost of a 14-foot-square model estimated at $2.78.

As the settler became more affluent, he might leave his dugout to the livestock and build a sod house. For this, he first cut from the prairie a supply of sod bricks, each about 3 feet long, and with these he proceeded to build, piling the blocks of turf one on top of the other. When the walls had reached the desired height, a forked pole was placed at each end of the structure to support the center beam. After the rafters had been added, the entire structure was covered with brush, grass, and sod. Wealthier settlers might construct wooden gables, and some even built the entire roof with lumber and tar paper. A more ambitious builder might also give his home a coat of plaster, both inside and out. The larger houses might be 16-by-20-feet long. Like the dugout, the sod house could not be kept clean, and in rainy weather the occupants were obliged to dodge muddy streams of

A Dugout was Usually the Settlers' First Home on the Treeless Plains.

When the Settlers Could Afford It, They Built a Sod House and Used the Dugout for Livestock Shelter.

water. Another disadvantage was that the lack of adequate windows restricted light and ventilation. The worst calamity that could occur was that the weight of a waterlogged roof might collapse the entire structure. To guard against this, poles were brought inside and braced upright under the ridge pole.

Despite their disadvantages, these earthen dwellings were well suited to the grasslands. They were warm in winter, cool in summer, could not be toppled by wind, and were prairie fireproof. It has been estimated that, as of 1876, nine-tenths of the population of Butler County, Nebr., had at sometime lived in sod houses or dugouts. Such earthen dwellings were, however, only expedients. The average life of a sod house was about 7 years, and as soon as the farmer could afford it, he exchanged his earthen home for one of lumber or brick.

The earliest settlers lived in a subsistence economy. Prairie housewives prepared such things as cornmeal mush, parched ground corn with milk, corn on the cob, dried corn, corn cakes, apple cornbread, corn dodgers, cornbread, and maize gruel. Sometimes, the settler families had nothing to eat for months at a time but corn products and under these conditions the children were likely to develop scurvy. As the farm families prospered they were increasingly able to supplement their diet with such foods as milk, eggs, pork, and vegetables.

Other essential elements were water and fuel. The prairie farmer's corn crop usually could do fairly well from average precipitation, but water was essential for his household and livestock. If he were fortunate enough to settle in a river valley, about all he needed was to dig a relatively shallow well, but as he moved away from lower ground, water became increasingly difficult to obtain.

In drier areas, natural and artificial cisterns were important, and each dwelling had its rain barrel to help meet household needs. On the prairies, wells had to be sunk at least 100 feet, and often as much as 200 feet. The farmer paid to have his well driven or drilled if he could afford it, and, if not, he dug it himself. Needless to say, it was no easy job to raise water from these depths with a bucket or handpump.

The farmers found an answer to their water problems with the invention and installation of the windmill, first manufactured in 1854. After the Civil War, these towers and whirling wheels began to appear along the valley of the Platte River, and by the late 1870's they had become common throughout the plains region. Windmills insured the farmer a convenient water supply for his household, enabled him to keep a herd of livestock, and permitted him to irrigate up to 2 acres of land if he wished to add to the variety of his produce. Feeding on the energy of the prairie winds and regulating its own speed and direction, the windmill was able to produce a dependable waterflow. Its other virtues were durability, easy maintenance, and economy. By using materials generally at hand, the farmer could fabricate a windmill for as little as $1.50 cash outlay.

Timber served for fuel as long as it was available. Finally stumps were dug up, and when these were exhausted, the settler might travel for many miles for even the poorest quality firewood. For a time, buffalo chips could be found on the plains and, though the farmer and cattleman later had difficulties, the settler was glad to have a trail herd pass his way, for each herd left a considerably supply of fuel in its wake.

Grass was the only abundant fuel on the plains, and special stoves were developed exclusively for its use. A unique feature of the grass burner was the detachable drum or cylinder magazine. While the contents of one or more magazines were being consumed, others were filled and held ready for attachment. The drawbacks of the grass stoves were the constant attention required, the fire hazard, and the noxious gases released during continual refueling. If corn was plentiful, the entire ear would be burned, as the oil-packed kernels made excellent fuel.

Among a plains farmer's many challenges was keeping his livestock confined and separated from his crops. Fencing was not such a problem on the timbered, eastern margins of the plains region where traditional types of wooden fence could be erected. But, in the rest of the area, timber did not exist in sufficient quantities. The settler's first expedient was to build his fences from the earth as he had done with his shelter. In Hall County, Nebr., in 1870, a fourth of the fences were made of earth.

The most successful early fencing experiment was the thorny osage orange hedge which tended to repel livestock. A practical, permanent solution to the fencing problem, however, came with the invention of barbed wire in 1874. J. F. Glidden of De Kalb, Ill., is credited with making it commercially feasible. It is said he built his first such fence in response to a plea from his wife to "dogproof" her garden. Once mass production made it economical, barbed wire supplanted all other types of fencing. When placed on posts of wood or stone, such a fence was cheap and durable, convenient to string, could not be easily blown over or washed away, and was effective in warding off or confining livestock. It was barbed wire more than any other invention or technique that made possible the great final surge of settlement that filled the plains.

The earliest settlers lived in a barter-and-subsistence economy, but the Civil War sparked an immense demand for food, and machinery was introduced to increase farm production. Machines could be utilized to their fullest on the open, broad, hard-surfaced plains. Perhaps the most revolutionary farm implement was the earliest and simplest — John Deere's steel plow. Such a tool was essential for breaking the tough prairie sod. Horse-drawn

corn cultivators began to appear in the 1860's, and in the late 1870's, Deere's corn-planting machines were introduced.

Distance was another element that had to be conquered. The plains Belt at its greatest width in the Missouri Basin is almost equal to the distance between the Mississippi and the Atlantic Coast. Transportation by steamboats was important in the earlier years, but it was the railroads, first traversing the plains in 1869, that gave settlement its greatest impetus. The railroads carried settlers, with their windmills, barbed wire, and farm machinery westward, and on the return trip, transported the farmers' meat and grain to eastern markets. Railroad companies actively promoted settlement along their routes, offering greatly reduced transportation fares, easy terms on railroad land, free seed, and free temporary housing for the settler at his destination. The farmers later struggled against the economic power of the railroads, but the fact remained that rails were essential to development of the land and utilization of its resources.

In 1881, some 300 delegates attended a Missouri River Improvement Convention at St. Joseph, to attempt to convince the Government that the river commerce, failing because of the rail competition, should be revived. Part of their argument was the inequity of freight rates. The rail rate between Kansas City and St. Louis was 13 cents per bushel for wheat and 8 cents per bushel for corn. The rate at which barges on the river would transport wheat and corn was 5-1/2 cents per bushel. Also, the owners of the barges charging this rate were reported to realize a profit of 100 percent.

The convention succeeded. In 1884, Congress created the Missouri River Commission, under the provisions of the River and Harbor Act of July 5, 1884. Congress charged the Commission with two principal duties: To superintend and direct the improvement already authorized for the Missouri River, and to consider and devise additional plans for improving the river for the purpose of commerce and navigation. Major Charles R. Suter was appointed chairman of the Commission, along with two other engineer officers and two civilians as members. The Commission was abolished in June 1902, and the work of carrying on the improvement was returned to the Corps of Engineers.

In the early years, the white prairie settlers lived much like the Indians of the region. Their homes were earthen dwellings and they subsisted on corn supplemented by a meager ration of protein. The white man's culture, however, would not continue to be conditioned solely by his immediate environment. He was the vanguard of a civilization which was increasing in population, expanding in area, and, at the same time, undergoing a profound technological transformation.

In the 1870's, civilization with its attendant industrial and scientific revolution overtook the American settler on his prairie homestead. Between 1850 and 1900, the Nation's urban labor force grew 600 percent, and the total city population increased from 3-1/2 million to 30 million. To meet this demand and to satisfy a large number of foreign consumers, America's new machines and techniques were applied to the soil. Machines made it possible and profitable to increase both the size of the farms and the acreage of a single, staple crop. Sowers, cultivators, reapers, combines, and windmills, along with barbed wire, animal husbandry, and scientific crop and livestock agriculture, were introduced.

Mass production took hold on the land as it had in the factories. Horsepower gave way to steam engines, and the fields yielded even more production. In the same period, railroad mileage continued to increase, linking the prairies even more closely to eastern markets and supply centers. Between 1860 and 1890, the country's farm acreage doubled, and the cultivated acres trebled. The corn-growing areas increased production during these years from under a billion bushels to well over 2-1/2 billion bushels.

If the farmer reaped benefits from this new mass-production economy, he also suffered from its evils. His well-being was still determined ultimately by the productiveness of the soils under his feet, but his problems were now ironically changed by the structure of the industrial society. His early challenge had been to scratch a mere subsistence from the earth, but now the more abundant his crops and livestock became, the poorer he found his lot. With machinery production, he earned his living from the sale of staple crops. The mass production economy made him almost as dependent on the retail store for his food and other supplies as it did his city cousin.

The Nation's economy underwent several periods of severe imbalance in the late 19th century, and in times of economic depression it was often the midwestern farmer who suffered the most. This was because of the peculiar nature of plains agriculture. A factory assembly line could be regulated, but farm production, depending largely on erratic weather, often resulted in near failures or unmarketable surpluses. The amount of rainfall that could be expected in any given season was especially uncertain in the plains region of the Missouri Basin. In 1870, the basin farmer sold his corn for $1 a bushel, while in 1890 he received only 25 cents a bushel. It was sometimes cheaper to burn corn as fuel than to ship it to market. Of special significance was the fact that the farmer's income from the sale of his produce decreased in relation to costs of the goods and services he had to buy.

The farmers expressed their discontent through such grass roots organizations as the Grangers, the Greenback Party, the Non-Partisan League, the Farmers' Alliances, and, finally, the Silver Standard Democrats under William Jennings Bryan. Their targets were the railroads,

the middlemen, and eastern monopolists, and their objectives were soft money and easy credit, regulation of the railroads, cooperative selling and buying, crop insurance, warehousing to store surplus crops, a graduated income tax, and a popular election of Senators which would give the sparsely populated farm states a louder voice in the Congress. The farmers' immediate gains were mixed, but eventually all of these "radical" measures were adopted.

Regionalism of the West was apparent also in national politics. Fear that the frontier settler with his radical ideas of democracy and strong tendency toward nationalism would upset the balance of national politics and erode the existing power structures was widespread in the East. This eastern fear had been a constant factor in American politics from the days of the first settlement west of the Alleghenies. Counteracting this fear was the belief among politicians, historians, and leaders of American thought that the West provided a "safety valve" for the people who were not content with the social order of the East. With unoccupied land to absorb the people when they could no longer tolerate the political, social, or economic conditions of the East, the Nation did not have to worry about a revolutionary explosion. "Whenever social conditions tended to crystallize in the East," said historian Frederick Turner, and "whenever capital tended to press upon labor or political restraints to impede the freedom of the mass, there was this gate of escape to the free conditions of the frontier." This theory lasted as long as the frontier. Whether it was true to any important extent is rather doubtful.

However, the conditions that gave support to the theory were the ones that gave the West a political regionalism. The distrust and suspicion of the settled areas helped in the formation of the western political block in national politics. This block has not always been unified, but it has been able to effectively trade its support to other blocks in the nation for their support in such things as the mintage of silver, reclamation, and farm improvement programs for the plains.

While most of the farmers' difficulties could be overcome by application of the same techniques and materials, as proven successful in humid-area culture, the deficiency of moisture required a drastic restructuring.

The first settlers established themselves along the rivers as had been the earlier eastern practice, and direct irrigation from the streams was the first method employed. But the pioneer farmer soon found that this method of water utilization was limited. Most of the plains rivers begin in the Rocky Mountains, which themselves are generally classified as semiarid.

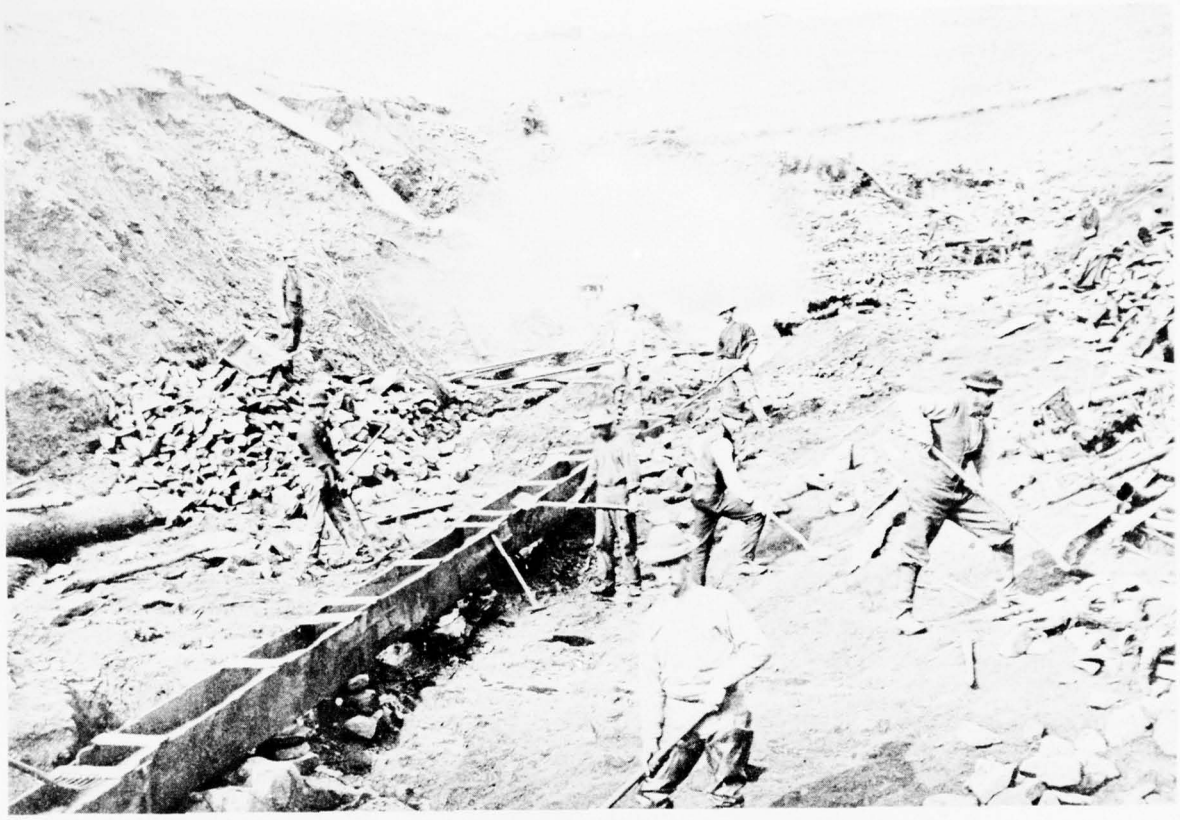
The plains farmer, with his thought pattern still rooted in a humid-area culture, had to make radical changes in his water-use habits. In humid areas where rainfall was plentiful and wells shallow, the rivers had less importance. There, the farmers who settled on the banks of a stream generally had the right to its contents, and water could not be diverted to noncontiguous lands, even though it was not being used by those residing along the banks.

Particularly in the western portion of the basin where the water supply was short, it became a commodity of considerable value, and a system of laws evolved to determine who had the right to water. Two basic doctrines were adopted reflecting the origin of those who formulated the laws: The doctrine of riparian rights was taken from French civil law by two American jurists, Story and Kent. Under this concept, the owner of land adjacent to a stream is entitled to receive the natural flow of the stream without appreciable change in quality and quantity. During the early 19th century, the English courts adopted the doctrine as a part of their common law. Subsequently, those American jurisdictions which adopted the English common law also accepted the riparian doctrine, and it found acceptance in the eastern United States. However, Missouri River Basin residents recognized early that the riparian doctrine was not suited to their needs. The concept of appropriation of water without regard to riparian rights was brought to the New World by the Spaniards, who adapted it from Roman civil law.

Since water was essential to hydraulic and placer mining, the western miners used the appropriation procedure to lay claim to water, beginning in the 1800's. Thus the miner's inch became a standard measurement in many of the Missouri Basin States. Water was appropriated in the mining areas by posting a notice of intent at the point of diversion, filing a copy with the local recorder, and proceeding to construct facilities and put the water to use. A principal element of the appropriation doctrine is "first in time, first in right." The Congress, through legislation in 1866, 1870, and 1877, placed the administration of water rights under the states, and by 1900 all Missouri Basin States, except Kansas, Missouri, and Iowa, developed water laws based on the appropriation doctrine. Kansas and Iowa laws now recognize the appropriation doctrine, but Missouri still adheres to the riparian doctrine.

Until after the Civil War, Congressional treatment of the Missouri River Basin and the semiarid lands of the West was much the same as that accorded the more humid areas of the Middlewest and South. Emphasis was on communications, Indian pacification, and settlement. If basin resources were mentioned in legislation at all, the references were generally limited to the "naked land," to lead and salt, iron and coal, timber, and to gold, silver, cinnabar, and copper.

With the close of the Civil War and the renewed surge of people to the West, it became apparent that the total resources of the West would need closer Congressional attention if the new citizens of that area were to enjoy



Miners Diverted and Used Water for Hydraulic Gold Mining. They Devised New Laws to Establish Rights for Water Use.

the same opportunities as did their forebearers to the east. Congressional enactments affecting the Missouri River Basin began increasingly to recognize that the creation of national wealth and of citizen opportunity depended to a large extent on the development of water resources. The recognition of water importance came first in minor matters, principally relating to rights-of-way for canals and reservoirs, but the scope and impact of Congressional action was progressively enlarged.

In 1877, the Congress passed the Desert Land Act. This act provided that a settler who was willing to develop irrigation would be entitled to acquire 640 acres of public land, but he was limited to 320 irrigable acres. The Act also provided for the use of water on non-riparian lands. This permitted the full development of the doctrine of appropriation and of the water-use principle of "first in time, first in right." Without this doctrine, irrigation would have been confined to the immediate river bottoms, since only riparian owners could then have legally used the water.

Maj. John Wesley Powell, the renowned geologist and anthropologist, well understood the futility of the early Government land and water policy. In his April 1, 1878 report to the Government and in specific proposals to the Congress, he recommended that farm units be greatly enlarged and water recognized as the key to successful farming or ranching.

Strong Congressional support for large-scale water resource development was expressed in the Joint Resolution of March 20, 1888. This resolution directed the Secretary of the Interior "to investigate the practicability of constructing reservoirs for the storage of water in the arid region of the United States." The resolution stated further that —

> ". . . a large portion of the unoccupied public lands of the United States is located within what is known as the arid region and now utilized only for grazing purposes, but much of which, by means of irrigation, may be rendered as fertile and productive as any land in the world, capable of supporting a large population thereby adding to the national wealth and prosperity. . ." .

At the same time, the Congress withdrew from sale or entry all lands needed for irrigation works or "susceptible of irrigation." The withdrawal was prompted by Congressional concern that "continued disposal of lands in that region under the land laws might render it difficult and costly to obtain the

necessary rights-of-way for canals and ditches." An outcry from prospective settlers, however, required a modification of the withdrawal action, and, in 1890, Congress stipulated that lands west of the 100th Meridian could be entered or sold if they were made subject to a right-of-way for ditches or canals constructed by authority of the United States.

In the General Allotment Act of 1887, the Congress gave further emphasis to water resource development when it directed the Secretary of the Interior to arrange for the "just and equal distribution of water" among Indian allottees. Succeeding agreements with the Indian tribes made additional and specific provisions for the construction of irrigation facilities.

Increased State participation in water resource development was sought through the Carey Act of 1894. Under that Act, the Congress provided that each of the public land States could receive up to a million acres of public land without charge if the State would arrange for the reclamation (irrigation) and settlement of such land in 160-acre tracts. It should be noted that development under the Carey Act never produced the results expected. The states were not in a position to take on aggressively the responsibilities which the act entailed. Ultimate development under the Carey Act was about 1,100,000 acres of some 4,000,000 acres originally considered. Simultaneously, with the Carey Act developments the new States of the Missouri River Basin began enacting water-use codes which would permit the orderly distribution and administration of water for irrigation and other purposes. The predominant pattern for these codes was that established for Wyoming by Dr. Elwood Mead, then Wyoming's State Engineer and later Commissioner of Reclamation. The Wyoming code provided for the filing of water right applications with the State Engineer to cover intended uses and for the adjudication of such rights after works had been completed and water applied to beneficial use.

Congressional enactments and grants of public lands and rights-of-way emphasized further the national interest in water resources development. New laws covered municipal water facilities, water transportation, and the development of power as subsidiary to the main purpose of irrigation, stock reservoirs, and fishways. Six thousand copies of a bulletin on "The Use of Water in Irrigation" were distributed. At the same time, Congressional appropriations for water surveys continued.

Some settlers seemed to believe that moisture would follow agriculture. At first, there was great hope among the settlers that subterranean water would nourish the crops. The most sought-after sources were artesian wells that bubbled to the surface of their own accord, but the geologic conditions that made such springs possible were rare. Much more common were the drilled wells operated by windmills. However, these were not adequate for general farming since one such device could supply no more than about 2 acres. Historically, the windmill was a valuable supplement to the irrigated or dry-farmed area. The small garden patch it kept alive during periods of drought meant the difference between the survival or abandonment of many plains homesteads.

Hardy W. Campbell of Lincoln, Nebr., brought dry farming to the Great Plains beginning in 1883. Another early experimenter, F. B. Linfield, worked in Utah and Montana from 1893 to 1937. J. E. Payne conducted research in Colorado and presented his findings in 1900. At the turn of the century, the Federal Government became interested in dry-farming techniques. Its chief investigator was E. C. Chilcott, whose report was published in 1910. The Plains farmers formed their own Dry Farmers Congress for exploration of their mutual problem.

An important challenge in Great Plains dry farming was the search for adaptable, drought-resistant crops. Two of the early Government researchers were Niels E. Hansen and Mark Alfred Carlton, who journeyed to such faraway places as Turkestand, Siberia, and Samarkand in search of plants that would serve the American Plains. Their explorations were prompted by Mennonite settlers from the Russian Steppes who brought wheat with them that produced better than native American varieties. The chief result of this extensive search was the hard winter wheat now grown from Nebraska southward and the hard spring wheat grown in the Dakotas and Montana. Of importance, too, was a new milling process developed to convert this wheat into palatable white flour. The introduction of dependable strains of wheat and other plants was also a boon to the farmers, who found that their economic well-being usually depended upon diversified crops.

The challenges faced by the Great Plains farmers were a magnification of those encountered in the subhumid areas further east. The fallow system and other factors required in successful dry farming meant that the plains farm had to be much larger than its eastern counterpart. For profitable operation, larger and more powerful farm machines were needed. Only by use of the modern tractor could the soil be tilled efficiently and in the special manner required on a large plains wheat farm.

The general farm problem of fluctuating income in relation to fixed costs and capital needs was particularly vexing to the plains farmer with his lack of diversity and greater exposure to natural hazards. Even more than the eastern farmer, he was in need of crop insurance, flexible loan repayments, storage arrangements, and price supports. The eastern agriculturists from the beginning had community interests, but on the plains the stockmen, irrigationists, and dry farmers were more isolated from one another.

While agriculture had a growing impact on the basin economy during this period, mining activity was still a

major factor in the development of the basin. The picturesque miner with pick, shovel, and pack mule, and the colorful, boisterous mining towns ended with the Black Hills gold rush, but the mining frontier left a heavy imprint on the Rocky Mountain region. Many mining centers disappeared or became ghost towns, but others, such as Helena and Denver, became leading cities of their areas.

Free gold was soon skimmed from the surface of the land, but large companies, with machinery and equipment that could crush goldbearing ore and wash large amounts of pay dirt, continued to exploit the mineral resources of the mountains. The original gold finds were later augmented by the production of silver, copper, lead, coal, tungsten, zinc, chromium, petroleum, molybdenum, and uranium. These minerals from the Missouri Basin's western zone contributed significantly to the Nation's industrial and economic development.

Frontier institutions took root in the mining camps as they had elsewhere. Vigilantism was most marked on the mining frontier because of the larger relative and absolute number of criminal elements. Claim jumpers were handled in the same direct, effective manner as the cattlemen handled rustlers.

The rules worked out by miners to regulate such things as disputes over claim boundaries and water use served so well that they later became the basis of State laws. One rule devised by Colorado miners, that did not become part of the State's law, declared that technicalities should not defeat justice and called for the barring of lawyers from miner's courts.

Perhaps the mining frontier had its greatest significance in the fact that it brought settlers to the Nation's more remote regions much sooner. Settlers did not cross the 20-inch rainfall line onto the High Plains until 1880, but 100,000 persons poured into Colorado following the gold finds of 1858 and 1859. By 1870, there were substantial areas of settlement in central Colorado and western Montana while the plains were still lightly populated. In that year, the two heavy mineral-producing States had a combined population of over 60,000 while the Dakotas had only 14,000. Furthermore, the miners helped bring settlement to the plains by encouraging the construction of roads, railroads, telegraph lines, and strings of outposts across the plains to their communities in the mountains.

Landmarks On The Plains

CHAPTER 6

CONSERVATION, DEVELOPMENT, ADVERSITY, AND REEVALUATION (1900-1930's)

Rapid settlement of the basin led to development and use of its natural resources. However, indiscriminate exploitation for private and sectional gain occasioned waste of the public land resources. Of all the persons engaged in the crusade early in this century for development and wise use of all the public lands, one man — Theodore Roosevelt — is the most remembered. He charted a new Government course in dealing with the public domain. Besides laying the basis for protecting forest lands, he also was responsible for creating new National Parks, game refuges, bird refuges, and for preserving the nearly extinct buffalo. He was largely responsible for passage of the Antiquities Act in 1906, under which Devils Tower in Wyoming was proclaimed the first National Monument, and creation of the Inland Waterways Commission to save the waterways for public use. Roosevelt established a conservation conference of State Governors, to awaken the states, a National Conservation Commission, and a North American Conservation Conference. Joining Roosevelt in this crusade was a singular individual in American history, Gifford Pinchot, the first native-born, trained forester.

In 1898 Gifford Pinchot was named head of the Forestry Division in the Department of Agriculture. He initiated the establishment of 19 national forests within the Missouri Basin that now total about 17 million acres. These forests are managed for sustained yields of wood, forage, water, wildlife, and recreation.

On the treeless Great Plains, the planting and care of tree windbreaks for protection against climatic extremes and for improvement of living conditions was a part of the settlement effort. The Forest Service not only aided the settlers directly in planting trees, but cooperated with the state governments in carrying out this program.

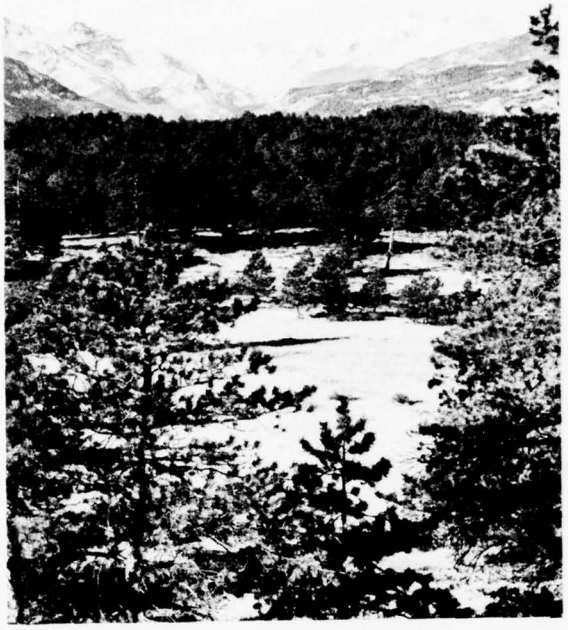
It was during this conservation era that the state park movement began to manifest itself in one of the basin States, Minnesota. In 1889, Camp Release Wayside, a site with historical associations, became its first state park. The first tract acquired in the basin proper for park purposes was in North Dakota in 1908. In that year, the Federal Government transferred to the State the lands comprising Fort Abraham Lincoln and Fort McKean, situated on the west bank of the Missouri.

In 1870 the Washburn-Langford-Doane party came to verify stories concerning the Montana frontier and was so impressed that it worked for preservation of the Yellowstone region as a public park. As a result, Yellowstone National Park was established on March 1, 1872.

The new park, the first of its kind to be placed under Federal management, passed through some difficult years, but its success as a form of land management was apparent by 1892, leading to establishment of other national parks, and, in 1916, to the establishment of the National Park Service. The Congress instructed the Service "to conserve the scenery and the natural and historic objects and the wildlife" in the parks, and to provide for public use "in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

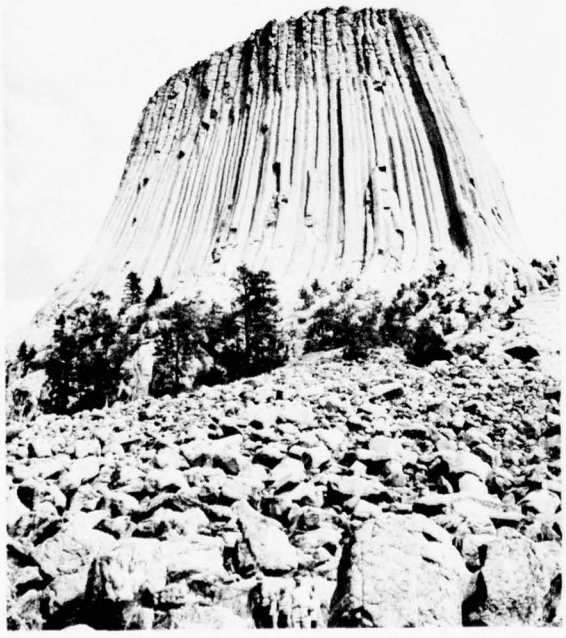
Water was recognized as one of the important resources of the Great Plains, and its development and use a key to settlement and survival. In his message to the Congress in December 1901, President Roosevelt explained the need and purpose of the Reclamation Act which became law about 6 months later, on June 17, 1902:

> "The pioneer settlers on the arid public domain chose their homes along streams for which they could themselves divert the water to reclaim their holdings. Such opportunities are practically gone. There remain, however, vast areas of public land which can be made available for homestead settlement, but only by reservoirs and mainline canals impracticable for private enterprise. These irrigation works should be built by the National Government. . .
>
> "The reclamation and settlement of the arid lands will enrich every portion of our country, just as the settlement of the Ohio and Mississippi valleys brought prosperity to the Atlantic States. The increased demand for manufactured articles will stimulate industrial production, while wider home markets and the trade of Asia will consume the

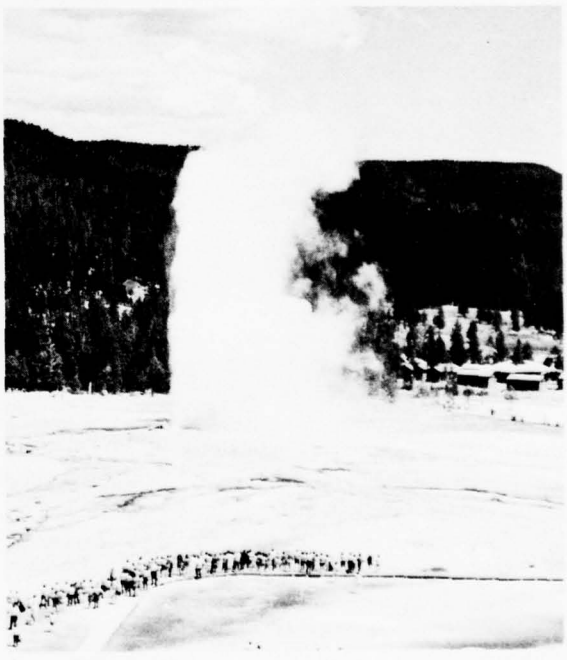


Rocky Mountain National Park, Colorado

Mount Rushmore National Memorial in the Black Hills, South Dakota



Devils Tower National Monument, Wyoming



Old Faithful Geyser in Yellowstone National Park, Wyoming.

National Parks Established in the Missouri Basin Were Among the First in the National Park System and Preserved the Natural and Scenic Attractions for Enjoyment of Future Generations.

larger food supplies and effectually prevent Western competition with Eastern agriculture. Indeed, the products of irrigation will be consumed chiefly in upbuilding local centers of mining and other industries, which would otherwise not come into existence at all. Our people as a whole will profit, for successful home making is but another name for the upbuilding of the nation."

Although irrigation greatly enhanced crop production in the dry plains area, all of the land could not be irrigated. This led to a continuation of dry farming, through the first part of the 20th century, for farm prices were good and the moisture cycle also was good on the plains. But the years 1917-21 were prolonged drought years on the plains. Feed for livestock was scarce and the price high. The crops of the 1920's might have made expenses if prices had remained high and postwar inflation had not set in, but prices collapsed. By 1924, many banks over the Nation and in the basin failed. Typical of the basin, 250 banks in Montana and 150 each in North and South Dakota failed.

The Fact Finders' Act of 1924 provided for studies on the easing of the water users' financial burdens, and, for the first time, provided that the irrigators' repayment of construction costs could be varied in accordance with farm income. The Omnibus Adjustment Act of 1926 adopted recommendations of the Fact Finders' Study Group and released construction charge repayment obligations on many acres which had been found unproductive for sustained farming.

In 1902 with the abolishment of the Missouri River Commission the Corps of Engineers again assumed responsibility of water resource measures on the Missouri River. From this date to 1929 priority was given to local flood emergency problems. The Congress, influenced by the flood of 1916 on the Mississippi River and its tributaries, passed the first Flood Control Act that asserted a direct Federal responsibility. This responsibility was interpreted to concern special problems, single purpose in nature. Additional flood problems caused the Congress to accept general responsibility and authorized the Corps of Engineers to make a comprehensive study, accomplished between 1928 and 1934, known as the "308 Reports." In 1938 the Congress adopted the first comprehensive plan for flood control and other purposes in the basin.

This concept of the multipurpose project, which came to full fruition in the Missouri River Basin, was demonstrated in the Boulder Canyon Project Act of 1928, affecting the Colorado River Basin. The Boulder Canyon project was to serve the purposes of recreation, river regulation, navigation, flood control, irrigation, domestic use, and power. While this plan was untried, its effect on planners in the Missouri Basin was electric. The tremendous potential of integrated resource development had been recognized and accepted.

The Reclamation Project Act of 1939 further endorsed the principle of integrated resource development, and established the proposition that the water user's obligation to repay project construction costs should be measured by his ability to pay.

With many streams crossing state boundaries, it was inevitable that water disputes would arise between states. In general these disputes took the form of a complaint by the downstream state that it was not getting a fair share of the water of a stream. A dispute between the states of Nebraska and Wyoming on the rights to North Platte River water resulted in litigation involving these two states and the state of Colorado, as an impleaded defendant, and the United States of America, intervener. As a result, the river now is controlled under a United States Supreme Court Decree consummated in 1945 and modified by stipulation dated January 14, 1953. The waters of the Laramie River are divided between Colorado and Wyoming by a similar decree.

The Supreme Court has long urged the use of interstate water compacts as a basis of agreement between states, and in 1911 the Congress passed a law giving blanket consent to interstate compacts. Several water compacts have been negotiated in the Missouri Basin and approved by the States involved and the United States Congress, or approval is pending. These compacts are:

South Platte River	Colorado-Nebraska	March 1926
Republican River	Colorado-Nebraska-Kansas	May 1943
Belle Fourche River	South Dakota-Wyoming	February 1944
Yellowstone River	Wyoming-Montana-North Dakota	October 1951
Upper Niobrara River	Wyoming-Nebraska	August 1969
Lower Niobrara River and Ponca Creek	Nebraska- South Dakota	(Pending in Congress)

A compact commission has been appointed and is negotiating a compact for the Big Blue River between Kansas and Nebraska. Compacts on the Cheyenne River between Wyoming and South Dakota, and the Little Missouri River between Montana, North Dakota, South Dakota, and Wyoming have been discussed but are not actively under negotiation.

Compacts relating to the Colorado River allot quantities of water for use in the respective states, and

these states can elect to utilize part of their allotments in other basins through transbasin diversions. Both Colorado and Wyoming already are diverting water into the Missouri Basin within the provisions of the compacts and are considering works for additional diversions. Colorado River compacts that have an effect on water importations and use in the Missouri River Basin are:

Colorado River	Arizona-California-Colorado-Nevada-Utah-New Mexico-Wyoming	November 1922[1]
Upper Colorado River	Arizona-Colorado-Utah-New Mexico-Wyoming	April 6, 1949

The Missouri Basin extends into the Canadian province of Saskatchewan and, while the comprehensive study does not include that portion of the basin, it is noteworthy that a treaty between Great Britain (Canada) and the United States was proclaimed in May 1910 dividing equally the waters of the St. Mary and Milk rivers between the two countries. Further, water management improvements in one nation producing significant effects upon the water resources of the other nation are subject to review and approval by an International Joint Commission established in accordance with treaty agreements between Canada and the United States.

Several court decisions have established a precedent that is interpreted as a basis for rights to the use of water on Indian reservations. Illustrative of these were United States vs. Winters, United States vs. Powers, and Arizona vs. California. Briefly, these decisions provide that Indians are entitled to the use of available water bordering, rising upon, or traversing their reservations, for beneficial purposes. The right to use such water is to be distributed equally to all Indian or formerly Indian-owned lands which can benefit therefrom. A precise judicial determination has not been made as to the definition of "beneficial use" or whether the right to use water is without limit. Several state water administrators have steadfastly asserted that the Indians are entitled only to that water for which proper application under state procedures has been made.

In trying to cope with economic pressures, the inhabitants of the basin often resorted to political action. Parts of the basin were in almost continuous political and economic revolt. These revolts were waged primarily through farmers' organizations and political parties as well as various cooperative efforts in the field of business. The discontent was directed mainly at monetary and marketing practices and railroad abuses.

The farmers' revolts were influential in initiating anti-monopoly legislation in many states. Also, they were influential in bringing about national banking reforms such as the Federal Reserve Act, the Federal Settlement Act, and other legislation to improve farmer credit facilities.

One of the major political revolts occurred in the formation of the Non-Partisan League in North Dakota. The League was organized in 1915 and its candidates soon controlled the State Government. Following the League platform, North Dakota established its own centralized banking system and a State-owned grain elevator and flour mill. The movement later spread into Montana, South Dakota, and Minnesota. The League soon lost much of its political power in the State, but the concept of using State-owned institutions to improve economic conditions was repeated many times.

Political discontent often began with the farmers. Their discontent often was associated with adjustment to new conditions and a quest for solutions to problems when old methods failed. They could not cope with the physical hazards of the plains and economic adversity at the same time. Consequently, the basin always was a strong supporter of farmer movements, regardless of where the movement began. This was evident in the formation of such organizations as the Grange, the Farmers Alliance, the Greenbackers, and the Farmers Union.

[1] The Compact was not in effect until June 25, 1929, following passage of the Boulder Canyon Project Act of December 21, 1928, ratification by six states, and passage of the California Limitation Act.

CHAPTER 7

A NEW ERA IN RESOURCE DEVELOPMENT AND MANAGEMENT (1930's - 1968)

The control of grazing, water, and the nature of land uses in the "dirty '30's" – a period that sorely tested basin residents – demonstrated man's ability to contend with and overcome the effects of droughts.

Even scientists do not agree on a quantitative definition of a drought – generally each investigator establishes his own. A drought might be considered analogous to beauty – "it lies in the eyes of the beholder." Those people who lived in the basin will never forget the great drought of the 1930's, which was of longer duration and more devastating than any previously recorded. Precipitation averaged 14 percent below normal basinwide, and in 2 years it fell 30 percent below normal. The amount of precipitation varied throughout the basin, and in some localities the deficit was more severe than the basinwide average deficits.

The greatest impact was felt when there were extended periods of little or no precipitation during crop planting and critical growing periods. Summer temperatures rose to as high as 120° F., and the accompanying hot dry winds destroyed crops and dried up the range, often within a few days. A large segment of the basin was referred to as the "dust bowl." Hot dry winds blew the unprotected soil into great dust clouds which partially characterized the period as the "dirty '30's." Dust drifts piled up along fences and buildings much like snow. There is no doubt that if some of the early explorers had revisited the Great Plains during this period, their image of the "Great American Desert" would have been substantiated.

Coupled with the drought, the Nation and the basin experienced an economic depression. Triggered by the stock market crash in 1929, the depression of the 1930's also was unprecedented. Some 8,000 banks with $5 billion of deposits became insolvent between 1930 and 1933. The Missouri Basin had its share of such failures and many farmers and businessmen lost not only their operating capital, but their reserves as well. Credit was almost unobtainable, and the concurrent drought and depression created economic chaos within the basin. As in the past when dealing with the Indians, building the railroads, or settling the basin, the people looked to their Government for guidance and emergency assistance. Confidence in financial institutions had to be restored, economic activity restimulated, and ways found to revitalize basinwide agriculture devastated by the drought and depression.

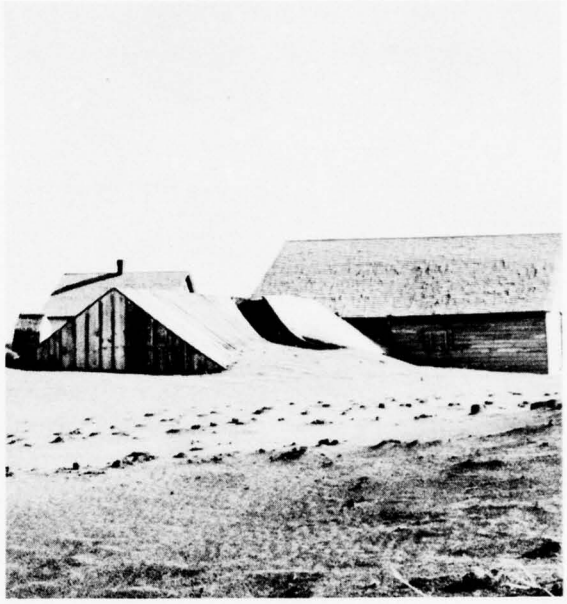
A first major step was taken when President Roosevelt declared a "bank holiday" to keep the banks from failing and restore the Nation's confidence. The Banking Act of 1933 helped restore confidence in the banking system and largely removed the "money panic" threat that had plagued them in the past. It has continued to be one stabilizing influence on the entire economy of the Missouri Basin.

In the mid-1930's, emergency public work programs were instituted to help relieve the unemployment situation. The Civilian Conservation Corps (CCC), Works Projects Administration (WPA), and Public Works Administration (PWA) were programs that came into being as a part of the economic "pump priming" effort. Most of these programs were coordinated with local and state governments and Federal agencies. These programs were largely phased out with the advent of World War II. While there was much criticism of the emergency programs, they left lasting landmarks within the basin. Nebraska's Lake McConaughy, the Tri-County power and irrigation systems, and the Loup River irrigation and power developments were examples of projects financed under the PWA. Many municipal water and sewage treatment plants in the basin also were financed under PWA. Throughout the basin the WPA constructed many municipal water distribution and sewage collection systems, farm-to-market roads, community buildings, airports, city street improvements, parks, and small water conservation reservoirs. Similarly, the CCC constructed campgrounds, fire roads, and wildlife refuges, and assisted with agricultural conservation programs.

While agriculture had been the dominant and motivating industry within the Missouri River Basin, this basic fact was brought home again to all basin residents by the tragic drought and depression of the 1930's. The negative impact of these adversities forced a reappraisal and the conclusion that a healthy agriculture is basic to the general economic well-being basinwide.

The drought of the 1930's caused much distress and disillusionment. One of the resources which had reached the critical stage was the range. After more than half a

Dust Storm



Drifted Topsoil

Field of Withered Crops

Thin Cattle on Dry Range

The Drouth of the Thirties, More Devastating than any Previously Recorded,
Will Long Be Remembered.

century of misuse and unregulated use, the unreserved western public lands had deteriorated rather seriously by 1934. These lands, which became the Federal range, were open to free access by anyone in a position to use them, without control and without management. Too many livestock at too early a season and for too long a time and without proper range management and needed range improvements resulted in the destruction of much of the carrying capacity of the Federal range.

This situation was changed materially by the passage, on June 28, 1934, of the Taylor Grazing Act. That act, for the first time, provided a system of management and control of the Federal range to preserve and increase its carrying capacity. Since the act was passed, livestock grazing generally has been maintained within the safe carrying capacity of the range. Furthermore, use has been restricted to the proper seasons of the year. Range improvements of various kinds have been made in many areas. With this management program, the natural recuperative powers of the range have had a chance to develop.

In retrospect, the drought had dried up the earth and thus the crops and the range grasses, desiccated the land in general, and brought about a condition that accelerated soil erosion when the rains did come. Livestock and cash crop prices fell to levels below production costs and often there were no markets for the produce that was raised. Ironically, this condition in the basin prevailed at the same time many people in the Nation were financially distressed and going hungry. Many basin farms were lost through foreclosure, thousands of tenants were forced to leave farms, and there was little demand for farm labor except at below-subsistence wages. It was evident that new concepts of water and land management and utilization, drought-resistant crops, and new methods of marketing, pricing, and financing had to be developed for a successful stable agriculture in the Missouri Basin.

Research in genetics, conservation, and management was stepped up at the state agricultural colleges and research stations, and studies and surveys of marketing, pricing, and financing were implemented. Emergency programs were implemented based on ideas and concepts prevalent at the time.

One of the first significant conservation measures was the Shelterbelt program initiated by President Roosevelt in 1934. Forty-four million trees in over 15,000 miles of shelterbelt were planted on the plains. They survived remarkably well and in maturity have provided shelter from summer and winter winds and for the catchment of snow. An incidental bonus has been the added habitat for birdlife and upland game.

Thousands of Miles of Shelter Belts on the Great Plains are Protecting Fields and Farmsteads and Provide Wildlife Shelter.

An overall conservation program was formally initiated in the Nation by passage of the Soil Conservation Act in 1935 and organization of the Soil Conservation Service in the Department of Agriculture. The SCS began active cooperation with local soil and water conservation districts set up by the states, beginning in 1937. This program provided technical and financial assistance in farm management and land and water utilization. The work, of necessity, had to be accomplished on privately owned land with most of the development by the land owner. Much of the initial work by the Soil Conservation Service was devoted to demonstration and preaching the doctrine of soil erosion control measures.

This program progressed rapidly from initial teaching and demonstration to action. Today approximately 40 percent of the private sector cropland has received adequate conservation treatment. Privately owned rangeland is over 40 percent treated and publicly owned rangeland is 55 percent under treatment. Eighty percent of the public forest land in the basin, and half of the private land, has been treated with conservation practices. While conceived in the throes of a drought, the program is a continuing one. The program was broadened considerably by enactment of the Watershed Protection and Flood Prevention Act of 1954. In this legislation, project limits were defined: Watersheds must not be larger than 250,000 acres and reservoirs not larger

Modern Agricultural Conservation in the Missouri Basin Conserves Moisture and Preserves Fertile Topsoil

than 5,000 acre-feet. Later amendments to the act provide for 25,000 acre-feet of storage, of which only 12,500 acre-feet can be for flood protection. The program, with minor adjustments, can provide the opportunity to rectify all conservation problems within a watershed on a completely coordinated basis. Twenty-nine watersheds are presently in operation, affecting about 900,000 acres; 88 are under construction to control about 4 million acres; and 48 are in the planning stage to affect about 2 million acres.

Also as a result of the national concern, the Resettlement Administration was established by Executive Order on April 30, 1935. Its program was directed toward (1) rehabilitating rural families, (2) rehabilitating land unsuited for farming, (3) resettling farm families on good land, and (4) developing three greenbelt towns near large cities to demonstrate improved town planning in suburban areas.

The Bankhead-Jones Farm Tenant Act passed in 1937 authorized the lending of money to farm tenants for purchase of farms and rehabilitation loans to farmers for subsistence, improvement, and other purposes. The Farm Security Administration also had authority to make limited grants to destitute farm families. The use of grants, combined with farm operating loans, made it possible for many families to continue operating their farms during the drought and depression. The Bankhead-Jones Farm Tenant Act also provided for farm use. These lands were transferred in 1954 to the Forest Service for administration. They now comprise most of the area within the National Grasslands. Conversion to grasslands and conservation have returned these lands to stable productive areas.

In the early 1940's, conditions improved due to a war economy and the need for emergency assistance diminished. However, progress of the technological revolution continued to accentuate the problems of beginning farmers and others with limited capital. After careful study of the basic issues, the Farmers Home Administration Act was passed in 1946. The FHA provides supervised agricultural credit for farmers unable to obtain credit they need from any other source on reasonable terms and conditions to make their farm operations successful. Also, it services disaster emergency loans due to conditions beyond the farmer's control, such as droughts, floods, hail, and adverse economic conditions.

The Agricultural Adjustment Act of 1938 was designed to meet drought emergencies as well as price and income crises resulting from surplus production. Marketing control was substituted for direct production control. Large stocks of wheat and feed grains resulting from this program became a military reserve of critical importance in World War II when national policy shifted to encourage production through incentive payments and higher support prices.

When the expiration of wartime price supports posed a threat to the national agricultural economy, the Agricultural Adjustment Act of 1948 was passed to provide mandatory price supports.

Contrasting the conditions of the 1930's and 1940's, the national policy of the 1950's could be generally characterized as a condition of impasse. Crop surpluses grew in the Nation and basin, fueled by research passed on to the producers. As a result marketing programs were unable to cope with the mounting national surpluses. The Soil Bank was then established to encourage a reduction in the amount of land planted to crops which were already surplus. Direct payments were made to the farmer to induce him to cut his production.

The Feed Grain Act of 1961 provides the basis for the present flexible price supports, the diversion of acreages to control supply, and the authorization of marketing orders. Surplus grain stocks have dwindled, partly from supply control and partly from expanded programs of export and foreign aid. Price support concepts have shifted from individual commodities to an over-all objective of fostering conditions where farmers on adequate-sized units can expect earnings equal to similar off-farm employment and investments.

Agricultural research has contributed much to change cropping patterns and yields in the Missouri Basin. Further, the development of hybrid corn and drought-resistant grain sorghums and the use of fertilizers, pesticides, and weed killers have done much to stabilize the farm enterprises. Research on processing and uses of the high-protein soybean has developed a market for this crop. Although practically no soybeans were produced in the basin before 1940, currently about 85 million bushels are produced annually. Great advances in dryland farming, utilizing stubble mulching, contouring, and summer fallow management, have done much to conserve soil moisture and stabilize wheat production in the semiarid sections of the Great Plains.

Irrigated agriculture has continued to expand rapidly, and currently the basin contains one-fifth of the Nation's total irrigated acreage. From 1949 to 1959 the basin's irrigated acreage grew from 4.6 million to 6.1 million acres, and in 1965 was about 7.4 million acres. This total reflected only 7 percent of the basin's agricultural cropland base, but the irrigated lands account for over 17 percent of the total average crop production. Surface water developments have made and are continuing to make their contribution, but private ground-water development over the past 20 years shows its current contribution as one-fifth of the total irrigation supply applied to about 30 percent of the total irrigated land. The results of such irrigation have contributed not only to the increased production of crops and livestock, but also to the stability of the total agriculture and over-all economy of this basin subject to the vagaries of nature.

Farm Lands in Colorado Irrigated From Snow-Fed Mountain Streams and Reservoirs

As the early settlers found, much of the basin is not conducive to timber growth. Today, only about 30 million acres, or 9 percent of the basin, support sufficient forest cover to be classified as forest land. Seventy-three percent of the forest land is in the Rocky Mountain and Black Hills regions, and consists mostly of stands of lodgepole pine, Douglas fir, Engelmann spruce, and ponderosa pine. Twenty-three percent of the forest land is in the Ozark Plateaus where the growth is mostly walnut, oak, hickory, and pine. About 77 percent of the basin's total forest land is classified as commercial forest, of which about 42 percent is owned and managed by the Federal Government. While timber-based manufacturing is not a major industry in the basin, accounting for less than 1 percent of the total employment, it has shown a steady growth, increasing by 12 percent in the last decade. Total timber products output in the basin was 139 million cubic feet in 1962. Forest lands in addition to timber production are recognized as areas that contribute to the water supply used for many purposes. The conservation of forest lands to stabilize and increase water yield is an objective of modern forest management within the basin.

The credit for the basin's growth since the 1930's has to go to its people. They have shown a continuing willingness to invest their time and money within the basin and to accept better farming methods, machines, and new crops. It has been only with their participation and cooperation that the various governmental programs mentioned in this chapter have succeeded. However, making a livelihood is still not an easy task for many in the basin. The climatic and physical hazards are ever present and the basin continues to face major economic problems. This history has shown that the past has been built upon thousands and thousands of trial and error decisions and constant progress. It is this determination by the basin's people to challenge the hazards they face and to learn from the consequences which holds the key to their future.

One cannot point the finger at any one of the many innovations and developments as being most responsible for the upsurge of agricultural production in the basin since 1940. A rapid spiral in all technological fields has contributed; also important has been the increased use of mechanical power and the release of land originally used to sustain millions of horses and mules. In 1940

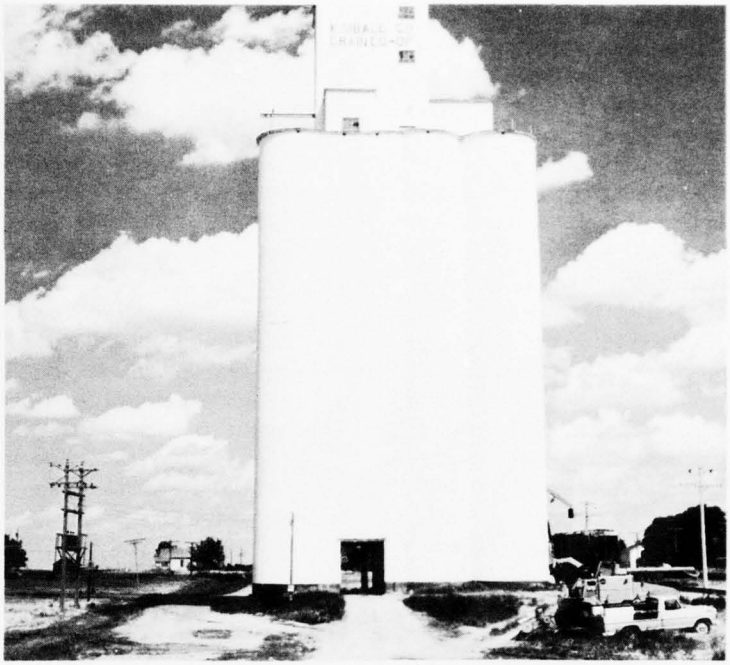
some 43 million acres of land were devoted to the production of crops to sustain horses and mules, compared with only 4 million acres in 1965. Important increases in production have been brought about by more timely and effective planting, cultivating, and harvesting operations through mechanization.

Changes in the agricultural industry since 1940 have caused many cultural and demographic changes in the Missouri River Basin. The average size of farms is increasing, from 512 acres in 1949 compared to 690 acres in 1964, an increase of 35 percent. Rural population accounted for 60 percent of the total basin population in 1940 compared with only 42.6 percent in 1960. One farm worker in 1940 could produce enough farm products to supply himself and about 10 other consumers, but in 1965 he produced enough for himself and 36 others. Overall farm production has increased 165 percent since 1940. This is made up in part by an increase of 157 percent in livestock and livestock products, 150 percent in all crops; poultry and eggs, 25 percent; and vegetable oil crops, 456 percent.

The Missouri Basin, while a relatively young area in terms of full development, has achieved a prominent status as a producer of agricultural products. The basin states are currently the leading agricultural commodity exporters in the United States, supplying over one-fourth of the Nation's farm exports. Among the principal export commodities, Kansas and North Dakota lead the other basin states in exporting wheat, and account for almost 30 percent of the national total. Iowa and Nebraska lead in exporting feed grains, and Iowa and Missouri in soybeans. Among some of the lesser volume commodities, Iowa and Minnesota lead in dairy products; Iowa and Missouri, in hides and skins; and Iowa and Nebraska, in lard and tallow.

In seeking solutions to another rural problem, the electric cooperatives became a significant part of the electric industry, beginning in the middle 1930's. Before that time, the investor-owned segment of the industry had extended electric service to only 10 percent of the farms in the country, because it was generally believed that rural service would not yield an adequate return on the required investment. The Rural Electric Administration was established by Executive Order under the Department of Agriculture in 1935, and the Rural Electrification Act was passed in 1936. This program was designed to stimulate farm electrification through low-cost loans. Today, due in a major part to the REA program, 93 percent of the farms are electrified. Electric and other forms of power have done much to change the farmer's life and his farm operation. He can now live as comfortably and conveniently as his city neighbors. Electric power is used to pump irrigation and livestock water, and has replaced many hand-labor operations on the farm. It has contributed, in part, to increased efficiency and larger farm units. Recognition of the farm needs and the strength of united action were largely responsible for growth of the public power movement. The directors of electric cooperatives are elected by the people within the area served. In turn, the cooperatives

Production Line Wheat Harvesting in the Missouri Basin



Grain Storage Elevators Stand as Familiar Beacons on the Plains

usually belong to a larger public power association. This has created an effective "grass-roots" organization that has become influential in most of the water resource development programs.

From its beginning more than 80 years ago, the electric power industry has had an outstanding vitality and growth. In the four decades from 1920 to 1960, kilowatt-hour generation increased 19-fold, or at an annual compound growth rate of 7.6 percent. Production in the basin was about 26 billion kilowatt-hours in 1960, and will be about double that amount by 1970. Private investor-owned companies account for about half of the total generation capacity. Publicly owned utilities serve large areas in North and South Dakota and all of Nebraska. In terms of dollar value of plant and equipment, the electric power industry is the basin's largest single manufacturing industry. All the large electric utility systems, with the exception of those in Wyoming and Colorado, operate in parallel and are a part of the large interconnected systems group which generally spans the United States east of the Rockies. Systems in Wyoming and Colorado are associated together in a pool interconnected with the Northwest Power Pool. Recently, the Northwest Power Pool and the eastern systems have been interconnected.

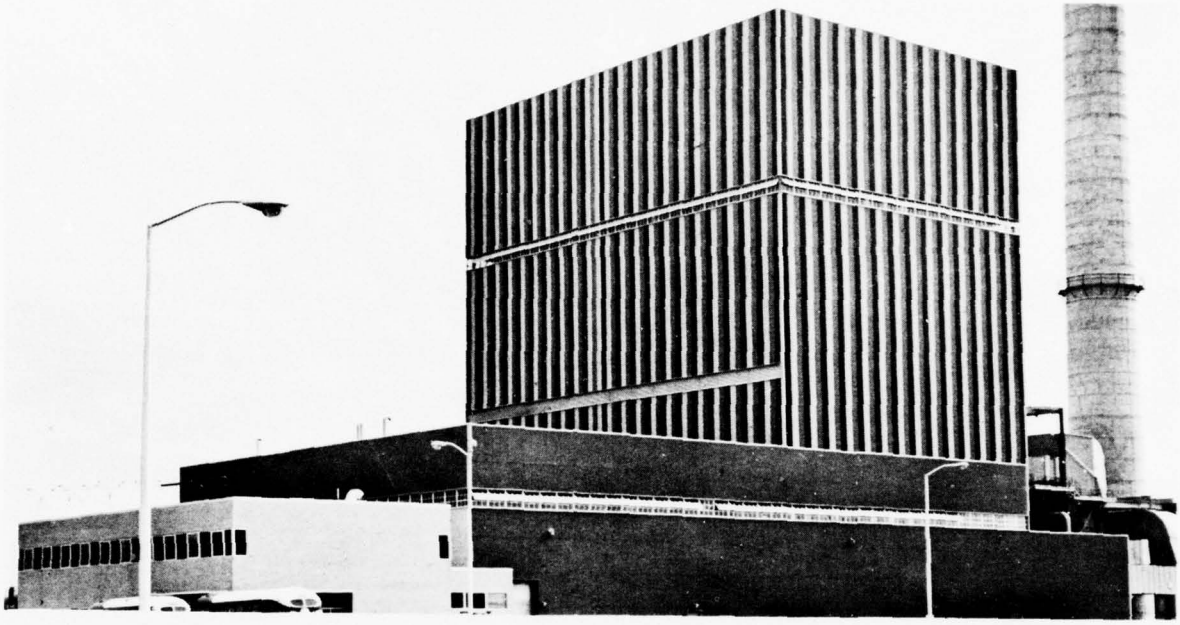
Mining activity in the basin, after a flamboyant beginning in the gold rush and silver era, has grown steadily. Total mineral production in the basin was valued at over $1 billion in 1963. Following the gold rushes, deposits of copper, lead, and zinc were exploited. More recently, ferroalloys and other minor metals have been produced in small quantities from localized ore deposits. Currently the open-pit taconite operation near Atlantic City, Wyoming and the development of the huge molybdenum ore body near Empire, Colorado overshadow other metal mining activities. These mining operations, plus the open-pit uranium mines in Wyoming and the continuing underground gold operations in South Dakota, indicate a recent trend toward the development of large low-grade metal resources in the basin.

Nonmetallic minerals include a broad array of construction materials — sand, gravel, stone, and clay — a number of fertilizer minerals — phosphate, potash, gypsum — and numerous minerals for chemical and other miscellaneous uses — fluorspar, lime, feldspar, mica, and salt. Generously endowed with a variety of nonmetallic mineral resources, almost every county in the basin has recorded annual production of nonmetallics. The bulk of this output is consumed locally, primarily for construction. The more valuable chemical and fertilizer minerals are processed locally and marketed regionally, nationally, and, in a few instances, worldwide.

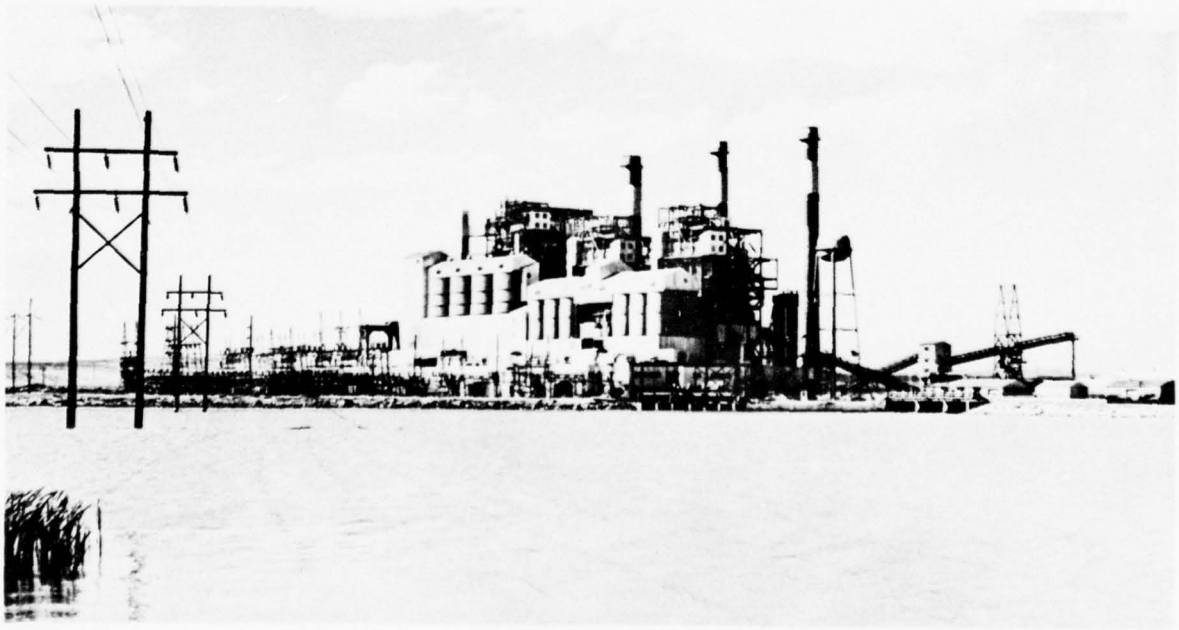
Mineral fuels, as a group, represent the greatest mineral treasure in the basin. Annual oil and gas production accounts for about two-thirds of the total mineral output value in the basin. Basinwide production of the petroleum industry has been in a strong uptrend since World War II, paralleling the national trend. Proven reserves in Montana, Wyoming, Colorado, South Dakota, North Dakota, Nebraska, and Kansas now approximate a

Many Farm Homes Lack Modernization and Many Others Have Been Abandoned

Modern Ranch Home in the Nebraska Sand Hills

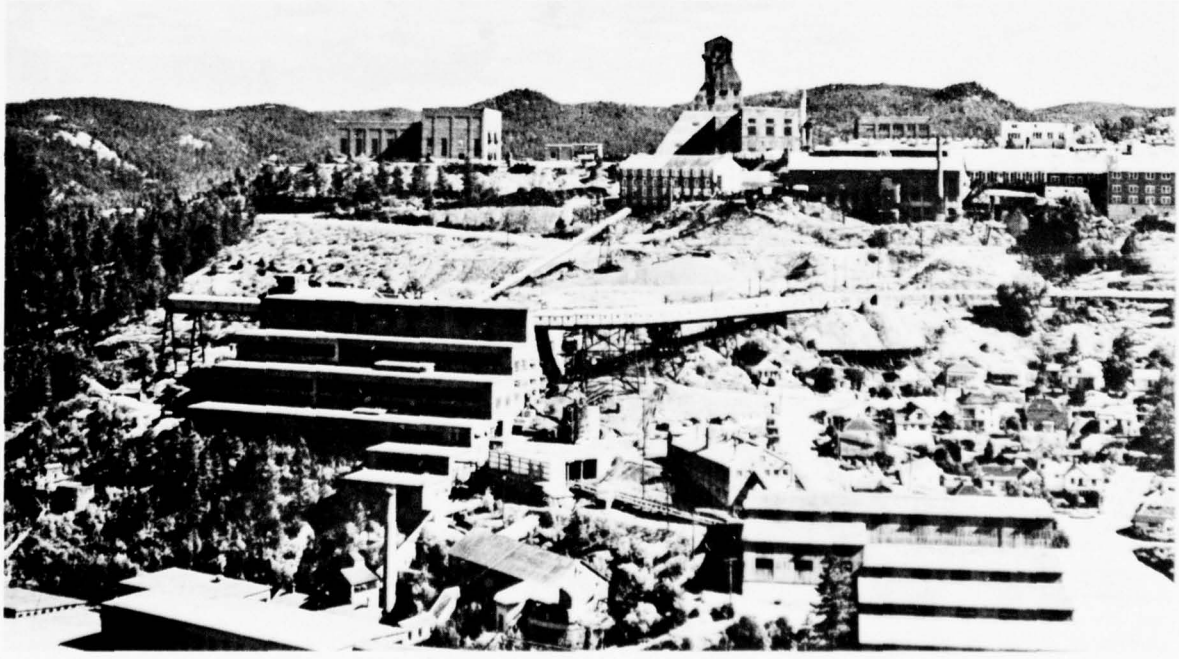


Basin Electric Power Cooperative's Leland Olds Steam Electric Power Plant near Stanton, North Dakota.
The 200-Megawatt Plant Withdraws 113 Million Gallons of Missouri River Water Daily.



Pacific Power & Light Co.'s Dave Johnston Steam Electric Power Plant at Glenrock, Wyoming.
Capacity is 420 Megawatts.

Mining Taconite Ore in Wyoming



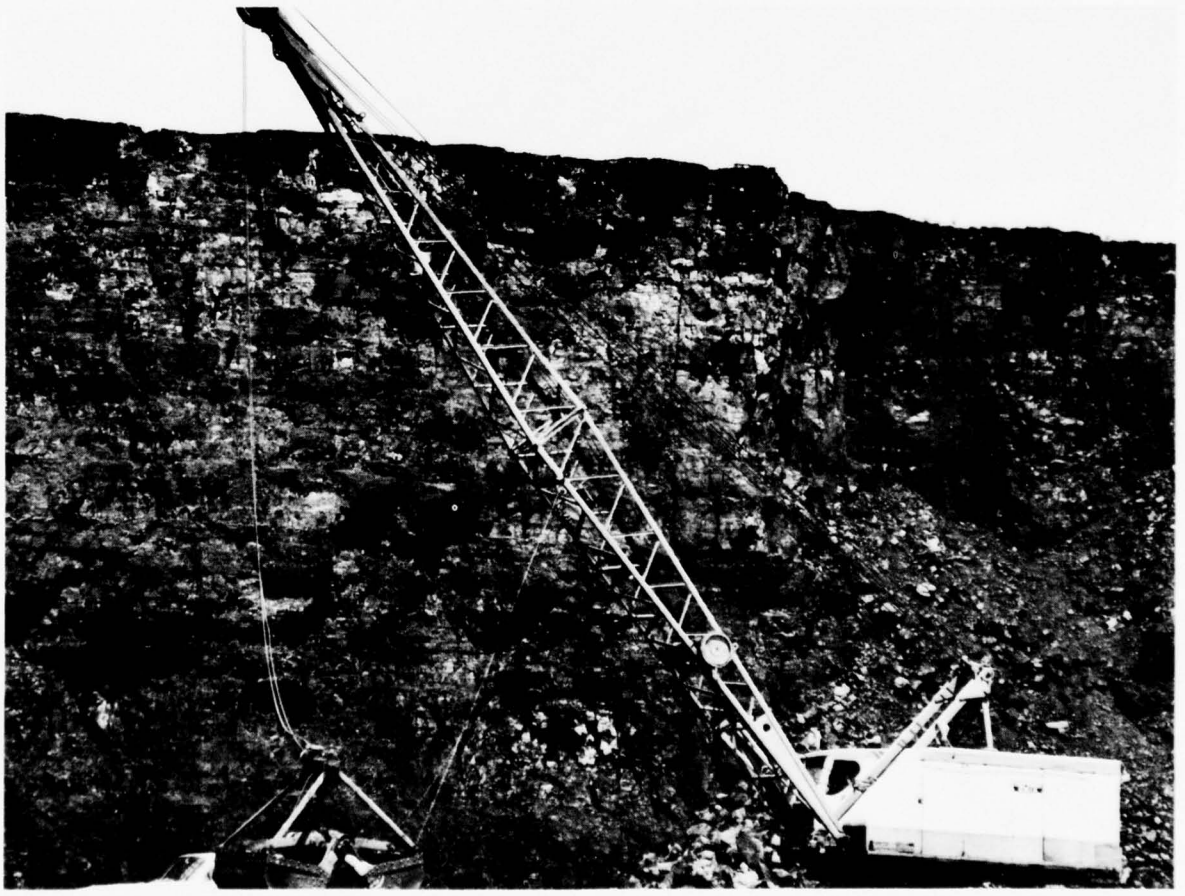
Gold Mining in South Dakota

10-year supply at the current rate of production in the basin.

The Missouri Basin States have more than 450 billion tons of recoverable coal reserves or about 55 percent of the Nation's total. The upper basin states of North Dakota, Montana, and Wyoming possess the bulk of the reserves — about 350 billion tons. Recent development of large minemouth thermal-electric power plants in Wyoming and North Dakota has created a new potential market for this vast resource. Progress made on liquified fuels research has resulted in large-scale leasing and planning in the coal fields of Wyoming and Montana by some of the Nation's largest producers. One problem associated with the utilization of near-surface coal deposits in the basin is some effective plan and means of accomplishing land reclamation for strip-mining areas such as illustrated by the accompanying photograph.

When President Roosevelt withdrew public lands from private entry in 1935, nearly 20 million acres remained in the public domain, located principally in Montana, Wyoming, Colorado, and the western Dakotas. The traditional concept of the public lands as a grazing resource only is gradually being widened to include all of the natural resource uses.

In the Missouri Basin, the public-domain lands currently support 1.2 million cattle and twice that number of sheep, during the seasons of proper use. Over 190,000 big-game animals graze these lands, utilizing forage reserved for their use. Approximately 26 million-board feet of saw timber are cut annually. There are an estimated 1.44 million annual recreation visits to the public domain, including sportsmen who harvest 17,000 antelope, 27,000 deer, 53,000 upland game birds, and substantial numbers of other game and fish. From these lands mineral products are extracted in quantity, particularly oil and gas. The revenues derived are returned: 37-1/2 percent to the state of origin, 52-1/2 percent to the Federal Reclamation fund, and 10 percent to the general treasury. The public land watersheds contribute importantly to mainstem flows, and



Wyodak Strip Coal Mine of Black Hills Power and Light Co. in Campbell County, Wyoming. Coal Face Varies in Thickness from 40 to 90 Feet. Coal is Classified as Subbituminous and Has an Average Heat Value of 8,000 BTU Per Pound

Reclamation of Lands Following Coal Strip-Mining Operations Is a Problem in Several Areas of the Basin

their vast acreages are being recognized for their contribution to the "open space" philosophy. Per-acre dollar values have increased dramatically in recent years, making the public domain a resource of great economic significance.

The public lands are managed by a decentralized organization, with major responsibility delegated to local management. The policies expressed by the Congress are carried out to stabilize the livestock industry, conserve soil and other natural resources, encourage such multiple uses as recreation and fish and wildlife, utilize timber, minerals, and other resources, and to make the lands available for urban occupancy and industrial development. Land classification is underway on a basinwide scale, to designate areas adapted to continued Federal retention and management, for use and preservation of their public values, to identify those lands needed in special local government programs, and to determine those best suited for disposition to private ownership.

The public domain is one of the principal areas of study of the Public Land Law Review Commission. The Commission was created in 1964 to review existing laws, regulations, and practices followed in management of the Federal lands, and to study the land resources. Among the important Commission objectives is to recommend modification of laws, administrative policies, and the Executive Branch organization, as deemed necessary, to meet current conditions affecting the management of Federal lands.

With the advent of a relatively dependable and inexpensive automobile during the 1920's, those lands containing natural wonders and special vacation attractions not only became more accessible to the basin residents, but also attracted millions of out-of-basin visitors each year. All of the States in the Missouri Basin have recreation attractions such as the Rocky Mountains, Ozarks, Black Hills, skiing, fine hunting and fishing, plus the less-definable spell of wide-open spaces. Estimates indicate that out-of-state visitors spend more than a billion dollars a year in the 10 basin States.

Both the summer and winter vacation and tourist business are of major economic significance in all 10 basin States, and even vie for second place in some. This trend was recognized in the basin during the 1930's, and most of the States organized parks divisions in the executive branches of their State governments. Their mission is to develop, manage, and publicize the outdoor recreation resources. The National Park Service, and the Federal Bureau of Outdoor Recreation established in 1962, cooperate with the State agencies. On October 15, 1966 Congress passed the National Historic Preservation Act (P.L. 89-665) to establish a program for the preservation of historic properties throughout the Nation. This Act recognized that the spirit and direction of the Nation are founded upon and reflected in its historic past, and that the historical and cultural foundations should be preserved. This program is an important consideration in Missouri Basin planning.

There are 176 Million Acres of Public and Private Grazing Land in the Basin

Winter Sports Are Popular

Water-Oriented Activities Highlight the Summer Season

New Campgrounds Have Been Added.

An important resource of the basin is its fish and wildlife. The great natural abundance that existed when the first explorers entered the basin has been greatly diminished. Much of this resource was exploited commercially and the habitat taken over for other purposes. The great herds of buffalo, numbering in the millions, are gone and only small herds are maintained for exhibit in refuges and parks. Their natural grassland habitat now is used for raising crops and livestock grazing. Even though greatly diminished, the basin provides some of the finest sport hunting and fishing in the nation, some in an almost pristine setting.

Nearly 300,000 big game animals of all species are taken in the basin each year. About 15 million small game birds and mammals are harvested annually, a third of which are pheasants. The Missouri Basin is in the Central Flyway for waterfowl, and provides not only breeding grounds but also resting areas for the migratory waterfowl flights passing through from northern breeding grounds to southern wintering areas. Currently about one million waterfowl are taken annually in the basin. A total of 43,500 miles of streams and 1.4 million acres of lakes and reservoirs supply about 17 million days of sport fishing annually. There are trout streams that attract fishermen from all over the Nation.

A constant encroachment upon the fish and wildlife habitat has resulted from the increasing population and more intensive use of the lands and waters for economic enhancement. To cope with this encroachment has required improved habitat management techniques and harvest controls. All the basin State governments now have fish and wildlife agencies whose purpose is to improve and manage fish and wildlife habitat and control sport and commercial fishing and hunting. These agencies participate in water resource planning and develop criteria to protect and maximize the fish and wildlife aspects of water resource developments. The Federal Bureau of Sport Fisheries and Wildlife and Bureau of Commercial Fisheries represent the national interests and cooperate with the State fish and wildlife management agencies.

The "dirty thirties" motivated a more comprehensive approach to development and management of all the resources in the basin. By that time, the concept of integrated resource development was being applied on a large scale in the Tennessee Valley, the Columbia Basin, and in California's Central Valley. In addition, two projects were initiated by Congress which were to affect the future design of Missouri Basin development. The first of these was the Fort Peck project in Montana which was authorized in 1933. Fort Peck Dam and Reservoir were conceived to serve navigation and flood control.

Investigation and construction of Great Plains projects were authorized under the Water Conservation and Utilization Act of May 10, 1939 and the Wheeler-Case Projects Act of August 11, 1933, as later amended.

The Basin's Trout Streams Provide Millions of Days of Sport Fishing

Huge Flocks of Waterfowl Rest and Feed on the Lakes and Refuges of the Basin.

These Acts paired the Interior and Agriculture Departments in a plan for relieving the effects of drought on the Great Plains and "providing opportunities for permanent settlement of farm families." The Interior Department was the constructing and operating agency, and the Department of Agriculture, the settlement agency. Also, a principle was announced that assignable construction costs should be repaid "within limits of the water user's ability to repay."

With the stage thus set, both the Bureau of Reclamation and the Corps of Engineers began planning for full-scale development of the Missouri River Basin. The Corps' plan, incorporated in House Document 475 (78th Cong., 2d Session), placed emphasis on flood control and navigation. The Bureau's plan, incorporated in Senate Document 191 (78th Cong., 2d Session), placed emphasis on irrigation development. However, both plans contemplated full multiple-purpose development, including hydroelectric power generation, with participation by all interested Federal and State agencies in the Missouri Basin. These plans were consolidated, and a single plan was approved by the Congress in Section 9 of the Flood Control Act of December 22, 1944 and was commonly known as the "Pick-Sloan Plan."

From the point of water resource development, the Missouri River Basin program was the most comprehensive that had been envisaged. It covered works for the development of irrigation; hydroelectric power; flood control; navigation and sediment control; domestic, municipal, and industrial water supplies; fish and wildlife; recreation; pollution abatement; and hydrology research. The plan, with several later adjustments, provided for the construction of 316 separate project units, with 112 dams having a total of 107 million acre-feet of storage capacity, 4.3 million acres of irrigation, 2.6 million kilowatts of hydroelectric power generating capacity, and a 9-foot navigation channel on the Missouri River from Sioux City to the mouth. The total cost of this plan was estimated at slightly over $5 billion, and construction is still far from complete.

The Congress has retained authority over some streams for purposes of navigation under the Commerce Clause of the U. S. Constitution. An important Congressional decision is contained in the O'Mahoney-Milliken Amendment to the Flood Control Act of December 1944, Section 1 (b), which reads, in part, as follows:

> "The use for navigation, in connection with the operation and maintenance of such works herein authorized for construction, of waters arising in States lying wholly or partly west of the 98th Meridian, shall be only such use as does not conflict with any beneficial consumptive use, present or future, in States lying wholly or partly west of the 98th Meridian, of such waters for domestic, municipal, stock water, irrigation, mining, or industrial purposes."

Six large dams and reservoirs on the Missouri River main stem above Sioux City, marvels of modern man's

ingenuity and engineering technology, have been completed by the Corps of Engineers. The reservoirs have a combined storage capacity of 75 million acre-feet and 2 million kilowatts of attendant hydroelectric generating capacity. These dams and reservoirs, operating concurrently with other tributary storage units, are providing a high degree of flood protection to the once vulnerable Missouri River flood plain below Sioux City. A long-dreamed-of 9-foot navigation channel on the Missouri River is nearing realization by the construction of channel works and the regulation provided by the upstream storage. The heavy load of sediment that heretofore characterized the river as the "Big Muddy" has been greatly reduced. The channel training works also achieve bank stabilization that has enabled a more intensive agricultural utilization of the flood plain.

Barge operators, eager to use the river for commercial transportation, have not waited for completion of the navigation works. Tows started using the river in 1935, and have steadily increased the annual commercial freight transported to 2.6 million tons in 1967. The old river ports, such as Sioux City, Omaha, St. Joseph, and Kansas City, are experiencing a rebirth of the river navigation activity which presaged their importance during the frontier and settlement period of the 1800's. The old paddle-wheel river steamer has been replaced by high-powered diesel towboats pushing as many as 12 barges in a single tow in the lower Missouri River. Modern port facilities for rapid barge loading and unloading are being constructed strategically along the river from Sioux City to the mouth.

Overall, the Missouri River Basin program is about 40 percent complete. In addition to the main-stem storage,

Although Treacherous, the Missouri River Was Used Extensively To Haul Freight and Passengers During Early Explorations and Settlement

A Deepened, Controlled Channel and Regulated Flows Have Extended Modern Intercontinental Navigation Into The Basin

Modern River Port Facilities Have Been Built To Handle The Increasing Tonnage

41 other dams on the Missouri River tributaries have been completed, with a storage capacity of over 24 million acre-feet, and about 370,000 acres have been furnished irrigation water. Supplementing the main-stem plants, 547,000 kilowatts of hydroelectric generation have been or are being installed, with over 10,000 miles of high-voltage transmission lines built to distribute the power produced. The reservoirs, with their thousands of acres of new water surface, lands, and facilities, have provided a rich new resource for recreation, fish, and wildlife. Public utilization of the reservoirs for recreation has greatly surpassed the original estimates, and additional studies and a revamping of this phase of the program are underway.

Floods have always plagued the Missouri Basin, with the characteristic "feast or famine" precipitation pattern of the Great Plains. The 1844 flood of near-legendary proportions is generally conceded to be the greatest

known on the Missouri River in the lower basin. Although actual records were not taken at the time, the flood has been traced and discharge at the mouth of the river estimated to have been about 900,000 cubic feet per second. The floods of 1881 are the second-greatest of record, and the June rise of that year was one of the largest late-spring rises. Following a wet year in 1880, the winter of 1880-1881 had below-normal temperatures and heavy snows, culminating in the heaviest snow blanket in the plains area by spring. Huge ice gorges in the Dakotas accompanied the spring thaws and ice breakup. A crest of 18-1/2 feet above flood stage at Yankton, S. Dak., was the highest known on the Missouri River. A tremendous ice jam extending from below Yankton to Vermillion, S. Dak., filled the river channel solid with ice for over 30 miles, rising in places to cover 30 feet above the water surface. The flood volume was estimated at over 40 million acre-feet at Sioux City, Ia.

During May and June 1951, precipitation was above normal over the Kansas Basin. This was followed by intense rains between July 9-13. During the 5-day period, 18-1/2 inches accumulated at the storm center and averaged above 8 inches over 30,000 square miles in eastern Kansas. At the crest of the flood, discharge on the Kansas River was 510,000 cubic-feet-per-second at Bonner Springs, and the discharge of the Missouri River was 618,000 cubic-feet-per-second near the mouth. A flood in April 1952 on the Missouri River and most of the tributary streams was of exceptional magnitude. The winter had been unusually severe with continuous low temperatures, and at the end of March one of the heaviest snow depths of history covered the upper plains. Snowmelt produced a flood discharge of 500,000 cubic-feet-per-second in the Missouri River at Bismarck, N. Dak., and 480,000 cubic-feet-per-second at Yankton, S. Dak. Although the flood had an exceptionally high discharge, the crest stages established at Bismarck and Yankton in 1881 were not exceeded.

Since 1938, the estimated cumulative flood damages in the Missouri Basin have exceeded $2.4 billion. The Kansas River flood of 1951, the Missouri River flood of 1952, and a flood on the South Platte River at Denver in 1965 accounted for approximately 65 percent of this total. An additional $2.1 billion in damages have been prevented by the Missouri River Basin project.

Concentrations of population and industrial activity, modern food processing plants, and certain agricultural enterprises, such as large-scale cattle feeding, have resulted in attention being focused on maintaining an acceptable quality of stream and underground water resources in the basin. This concern has been commensurate with a growing national realization of the problem. The basic Federal Water Pollution Control Act of July 9, 1956 supplemented by amendments of 1961, the Water Quality Act of 1965, the Presidential Reorganization Plan No. 2 of 1966, and the Clean Water Restoration Act of 1966, led to creation of the Federal Water Pollution Control Administration (now Federal Water Quality Administration) within the Department of the Interior. The Clean Water Restoration Act required setting water quality standards and continued surveillance by the states for all designated interstate streams, beginning in July 1967. All Missouri Basin States complied not only with basic requirements of the acts, but some adopted or improved standards as applicable to their intrastate streams. Thus, the stage is set not only to arrest further degradation in water quality for streams and lakes of the basin, but to seek progressive enhancement.

When the Nation has experienced a hardship situation, it reacts to cope with the problems. The 1930's were such a period. A National Resources Planning Board was formed to deal with the effects of the droughts and economic depression. This board organized drainage basin committees in some of the principal river basins. After some discussion among the governors of the upper Missouri Basin States, it was decided that an organization was needed in the basin. The Governors of North Dakota, South Dakota, Montana, Wyoming, and Nebraska were asked to name delegates to a States Committee. They complied, and on July 29, 1942, the "Missouri River States Committee" met in Billings, Mont. The organization, scope, objectives, and activities of the committee were discussed. Iowa, Kansas, and Missouri were invited to become members, and their representatives attended the next meeting in Omaha on May 21, 1943. Colorado and Minnesota later joined the committee. Governor M. Q. Sharpe of South Dakota was elected as first permanent chairman of the committee and George S. Knapp as the first permanent secretary.

The aim of the Missouri River States Committee is to foster and expedite the planning, development, and use of the water and allied resources of the Missouri River Basin for the greatest common good of the basin and the Nation. It attempts to realize this aim through cooperative and unified action. There are no formal bylaws or constitution. The committee, as finally organized, is comprised of the governors of the 10 Missouri Basin States, and two technical advisors from each State appointed by the governor – a total of 30 members. The committee has been an effective states representation in coordinating and guiding resource planning and development in the Missouri Basin since its formation.

In the forefront of basinwide planning and development since 1945 has been the Missouri Basin Inter-Agency Committee. This committee, comprised of the 10 State Governors and representatives of the Federal Departments of Agriculture, Army, Commerce, Health Education and Welfare, Interior, Labor, Transportation, and the Federal Power Commission, was organized to

Despite the Completion of Major Control Works, Devastating Floods Still Occur in the Basin

effectively interchange information and to coordinate the water resource development programs. The committee's first session held at Omaha, Nebr., in July 1945 presaged over 160 meetings since then in various locations throughout the basin. These meetings have provided a means for review of progress, discussion of different viewpoints, resolution of differences, and a basis for reaching a common understanding. Because the meetings are open, the public has attained a better understanding and has better followed the course of the many facets of water resource development in the basin through the continuing efforts of the committee.

This era during which the committees have functioned has shown significant changes in socio-economic advances, particularly because of the rapid technological developments since World War II. Radio and television communication advances have placed the remotest resident of the basin at the scene of national and world events, provided a medium for dissemination of information on research and management, and closed the gap between urban and rural residents. Modern air, highway, rail, pipeline, and water transportation have provided not only improved markets for basin products, but have moved the import market to the producer's front door. Many services previously performed on the farms or locally are now being concentrated in the larger cities that form hubs of commercial, cultural, and manufacturing activity. The "little red schoolhouse" and the "country doctor" are disappearing from the plains, as they are replaced by modern consolidated schools and medical clinics. With these developments, and the trend to larger farms, fewer people are living in rural areas today. Only 42 percent of the population is currently classed as rural, compared with about 60 percent in 1940. Moreover, 65 percent of the urban population is concentrated in 11 metropolitan areas, with Denver, Omaha, and Kansas City accounting for three-fourths of the urban total.

Data on employment often permit some insight into the culture of the people of an area. Statistics show 37 percent of the total population in the Missouri Basin was gainfully employed in 1960, which approximates the national average. Agricultural employment in 1960 was the largest single sector, representing about 17 percent of the total, although there has been a steady decline in numbers and percent participation in recent years. Agricultural employment accounted for about 35 percent of the total in 1940. This change is accounted for, in part, by increased mechanization and efficiency on the farms, but also in part by statistical classification of agricultural employment. Today many trades and services and even manufacturing enterprises are closely related to agriculture and directly assist the farm operation such as machinery maintenance, feed grinding, fuel delivery, electric power supply, and fertilization. The majority of these services was not available or us by the farmer 20 years ago.

Manufacturing has shown a steady increase in t basin and accounted for slightly under 14 percent of t total employment in 1960. Food-products processing the largest manufacturing sector enterprise, with m packing the largest industry. Omaha, in terms of ann sales, is the largest livestock market in the United Stat Sioux City, Ia., and St. Joseph, Mo., and the Kan Citys, also have large markets and meat packing plan Twenty-five percent of the Nation's sugar beets grown and processed in the basin, mostly in Colorad Nebraska, Wyoming, and Montana. In 1940, 49 perce of the basin employment was in commodity-produci industries, including agriculture, but this ratio declin to only 38 percent in 1960. The attendant growth in t noncommodity employment has been spearheaded strong advances in retail trade and medical, education and professional fields. Education has shown a partic larly strong growth, with each State, except Minneso Iowa, and North Dakota having one or more lar universities located within the basin. There has been growing concern that many of the highly train university graduates are leaving the basin for emplo ment elsewhere; however, many do remain in the bas and contribute to the advancing cultural level.

The Indian has had an important influence upon t history of the Missouri Basin and contributed much its cultural heritage. His words have become the nam of states, streams, landmarks, parks, and cities. H myths and heroes enrich the literature. His lore colo the art. But since the end of the Indian wars, the plig of the Indian has been that of hardship and bewilde ment as he has tried to assimilate the white mar culture.

In 1966, there were approximately 58,000 Indi people residing on or near 23 reservations in six states the Missouri Basin. As individuals or tribes, they ow about 12 million acres of land within the basin, to whi the title is held in trust by the United States Gover ment. Locations of the 23 Indian reservations a settlements are shown in figure 8. The present medi family income is generally low, though it varies wide from one reservation to another. Lack of employme opportunities is a major cause for the low avera income of Indian families. Reservation unemployment 1966 ranged from a low of 24 percent to a high of percent of the employable work force. This lack employment is due in part to the reluctance of t Indian people to leave the reservations and seek emplo ment elsewhere. Development of industry on t reservations has been slow because of distance fro markets and lack of raw materials, services, and inve ment capital. Large areas in Montana and North a South Dakota are influenced by the comparatively lo Indian economic base. This condition is recognized

Field and Factory Contribute Beet Sugar, and also Tops, Pulp, and Molasses as Livestock Feed Supplements

Livestock Markets and Meat Packing Plants Provide Important Outlets For the Ranchers and Feeders

Millions of Livestock Are Fattened in the Basin's Feedlots

local, state, and national authorities, and programs are being pushed to improve educational opportunities, housing, health and medical care, essential community services, transportation, jobs, and economic development for the Indians.

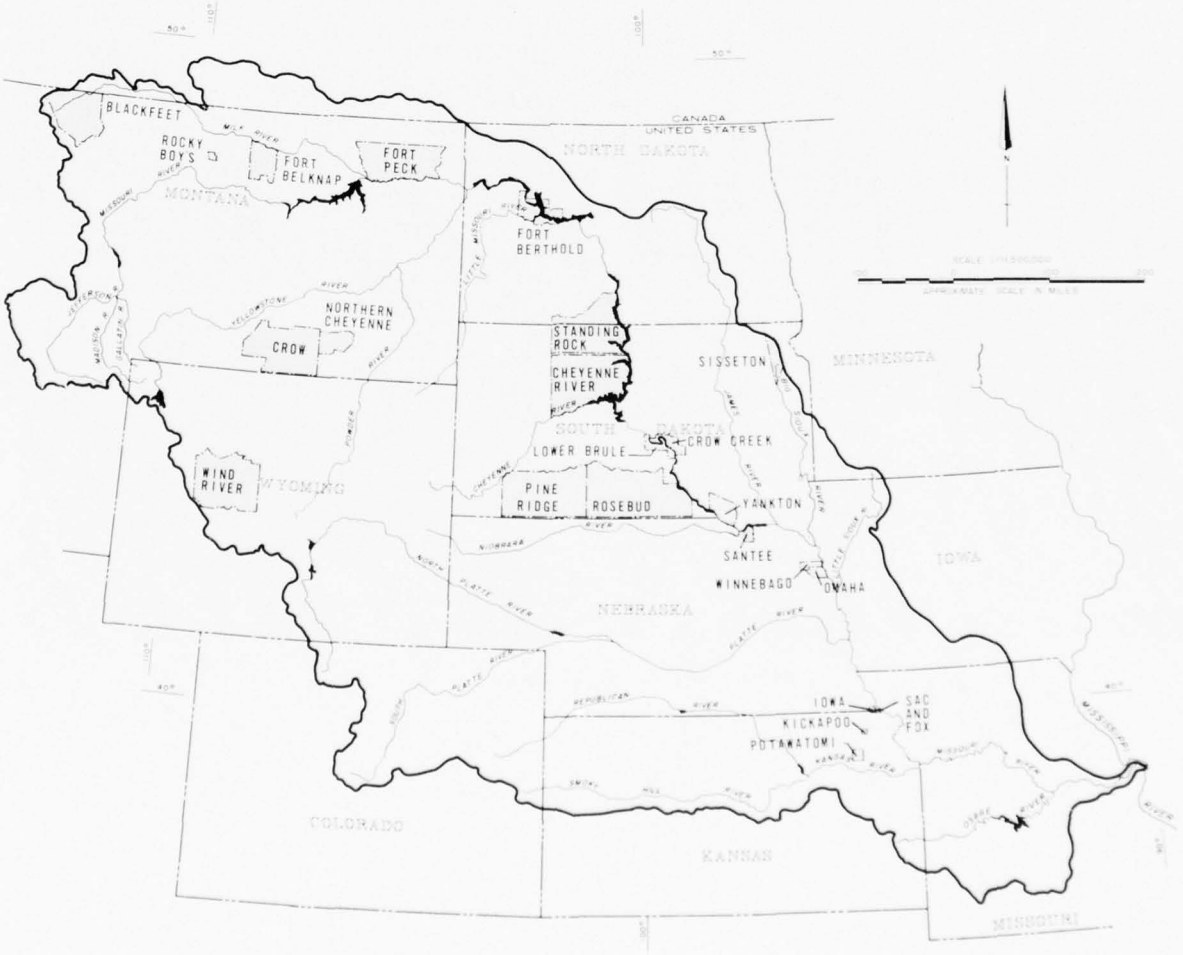
As the 1940's ushered in new concepts of resource development in the Missouri Basin, the 1960's have furthered and expanded the emphasis. The 1960's showed the entire Nation concerned and at work to conceive framework plans for water and related land resource development in all basins. A Senate Select Committee on National Water Resources was established in April 1959 under the provisions of Senate Resolution 48, 86th Congress, to study the national interest in water resources activities.

Largely as a result of the Senate Select Committee findings and recommendations, the late President Kennedy requested a comprehensive study of all major river basins in the United States, in a special message to the Congress on natural resources on February 23, 1961. The Congress reacted favorably and appropriated money to initiate studies in several selected basins. The Missouri Basin Inter-Agency Committee agreed early to proceed with a comprehensive study in the Missouri River Basin. This comprehensive study was started in June 1964, with the States and Federal agencies as partners.

Subsequent to this start of the Missouri River Basin comprehensive study, but furthering the objectives, the National Water Resources Planning Act was passed on July 22, 1965. This act places the River Basin Comprehensive Planning Studies under supervision of a Water Resources Council composed of the Secretaries of the Army, Agriculture, Interior, Transportation, and Health Education and Welfare Departments, and the Chairman

FIGURE 8

INDIAN RESERVATIONS AND SETTLEMENTS



of the Federal Power Commission. All States in the basin requested and were granted initial funds for water and related resource planning provided under the act, and are proceeding to develop and maintain, as well as to implement, comprehensive resource development plans for their respective areas.

Today, the Missouri Basin faces the future with every sign urging reassessment of its natural resource base to insure preservation and development for the needs of its growing population. Champions of the past have pointed the way — John Muir, who spoke for the mountains and wilderness in a voice that moved even the least sympathetic; Theodore Roosevelt, who left as heirlooms some of the biggest sticks to enforce conservation policy; Carl Schurz, the German-American Civil War general and Interior Secretary, who tried to halt the uncontrolled exploitation of federally owned forests and paved the way for Gifford Pinchot to carve out the National Forest System; and Stephen T. Mather, who gave up a prosperous business career to make the National Park System a reality.

New, careful, but daring programs in the basin must be designed not just to remedy the yesterdays, but to enhance the tomorrows. They should be deeper than soil conservation, broader than wildlife preservation, more challenging than forest husbandry, and more encompassing than the control of air and water pollution. Comprehensive framework planning permits a clear though broad-scale delineation of the competitive demands for resource uses. In looking to tomorrow, there is need to consider not only the requirements of man, but the total environment which sustains him.

The Perspectives of Today Give Promise For Tomorrow.

INDEX TO HISTORICAL ITEMS

INDEX (Continued)

INDEX (Continued)

COMPREHENSIVE FRAMEWORK STUDY
MISSOURI RIVER BASIN

APPENDIX

HISTORY OF THE FRAMEWORK STUDY

MISSOURI BASIN INTER-AGENCY COMMITTEE

JUNE 1969

CONTENTS

FIGURES

CONTENTS (Continued)

PHOTOGRAPHS

The photographs included in this appendix were furnished by:

FOREWORD

This appendix documents the inception and progress of the Missouri Basin Comprehensive Framework Study from 1962. Behind the study lay many decades of water and related land resources investigations. The Flood Control Act of 1938 resulted in development of a Comprehensive Plan for the Missouri Basin. The need to coordinate and update this plan led, in turn, to the formation in 1945 of the Missouri Basin Inter-Agency Committee (MBIAC). From its original representation of four Federal Departments and four State members, the Committee has grown to its present composition of a representative from each of the ten Basin States and from nine Federal agencies. Through the years it has provided continuing leadership in coordination of the basin's water resource planning and development activities.

A Mountain, Stream, and Valley Headwaters Area, Montana

CHAPTER 1

THE STUDY IS PROPOSED

At the 128th Meeting of the Missouri Basin Inter-Agency Committee held in Colorado Springs, Colorado, December 14, 1962, the Missouri River Division Engineer, Corps of Engineers, spoke on comprehensive basin planning. He pointed out that the original Comprehensive Plan for the Missouri Basin was nearly 20 years old and that consideration should be given to re-study and its updating. The charter of the Inter-Agency Committee placed on the Committee responsibility for coordination of such activities.

State representatives indicated interest, but expressed some reservation as to whether they could participate adequately. Federal Agency representatives were generally favorable to the suggestion. Action on the suggestion was deferred to the next meeting.

When the Missouri Basin Inter-Agency Committee met in Vicksburg, Mississippi on February 20, 1963, a *motion* was adopted to establish a subcommittee to explore the general possibilities, scope, and objectives for preparation of a comprehensive study of water and related land resources for the Missouri River Basin. The Subcommittee on Comprehensive Basin Planning was to consist of one representative from each Federal agency and each State on the committee. It was asked to report to the main Committee by the end of the fiscal year.

The Subcommittee held three meetings about a month apart and reported to the Missouri Basin Inter-Agency Committee at its 131st meeting in Jackson, Wyoming on June 18, 1963. In the report, the Subcommittee members found unanimously that it would be desirable to undertake a study. With respect to the scope and objectives, the Subcommittee considered that the Comprehensive Framework Study for the Missouri Basin would produce long-run projections of economic development and translate such projections into demands for water and related land resource uses. To satisfy these demands, there would be developed hydrologic projections of water availability both as to quantity and quality, and projections of related land resources availability so as to outline the characteristics of future resource problems and possible broad solutions, together with an indication of priorities. Such a plan would allow subsequent detailed studies of specific projects to flesh out the framework's skeleton. The recommendations of the Subcommittee on Comprehensive Basin Planning were that:

1. The MBIAC undertake a study leading to a comprehensive framework plan for the Missouri Basin.
2. Each Agency and State participate to the maximum practicable extent, considering its interests and responsibilities.
3. A Subcommittee on Comprehensive Framework Planning be established to undertake the study.

During discussion of the Subcommittee report, one Committee member commented that he did not think the definition of scope apprised members of MBIAC of the magnitude of the undertaking they were considering, its cost, or time required. The Chairman replied that the Subcommittee recognized a detailed outline was the next step, with estimates of cost and a time schedule to follow, but felt these were beyond the charge given the Subcommittee when it was created. The Missouri Basin Inter-Agency Committee accepted the report, continued the Subcommittee, and extended its assignment to include completion of a detailed outline of the study, cost estimates, and time schedules within 6 to 8 months.

FIGURE 1

MISSOURI RIVER BASIN

CHAPTER 2

THE STUDY IS DEFINED

The Subcommittee on Comprehensive Basin Planning established five work groups. Each of the Work Groups consisted of representatives of the States and Federal Agencies who felt they could contribute to the study. To fill out portions of the scope statement the Subcommittee made assignments as follows:

1. ***Work Group on Economic Base Study and Projections*** "- - - long-run projections of economic development - - -."
2. ***Work Group on Water and Related Land Resource Needs*** "- - - translation of such projections into demands for water and related land resource uses - - -."
3. ***Work Group on Hydrologic Projections*** "- - - hydrologic projections of water availability, both as to quantity and quality - - -."
4. ***Work Group on Land Resources*** "- - - projections of related land resources availability - - -."
5. ***Work Group on Water and Related Land Resource Development*** "- - - so as to outline the characteristics of projected water and related land resource problems and needs and the general approaches that appear appropriate for their solution."

In the latter part of June 1963, the Washington offices of the Federal Departments concerned with water and related land resource planning put out a call for coordination, by the field offices, of FY 1965 budget requests for comprehensive basin planning. General guidance as to the form of the coordinated budget request was furnished to MBIAC. The Chairman of the Subcommittee for Comprehensive Basin Planning was designated to coordinate preparation of a consolidated budget request for the field agencies. Representatives of the Federal Agencies on the Subcommittee were assembled on July 16 and again on August 6 & 7 to prepare the budget request. At this time, the Subcommittee had not received any part of the detailed study outline. Rather, each agency had to utilize the definition of scope and anticipate its participation. The budget request consisted of a consolidated table of total funds and their distribution by fiscal years and individual agencies, work anticipated to be accomplished during the study, work to be accomplished during FY-1964, and a program for FY 1965 indicating agency activities. This was supported by individual agency justifications. As might be anticipated, the initial consolidated estimate was somewhat high and MBIAC took note of this in forwarding the coordinated budget to the Interdepartmental Staff Committee.

The Subcommittee met August 28 and was briefed on the coordinated budget data. Considerable time was spent discussing what the Work Groups should do in preparing the plan of study. Although many specifics were considered, it was the consensus that the Work Groups which consisted of experienced personnel in the planning fields should be given only broad guidelines. One prime issue emphasized by State Representatives was that the final product should be the joint effort of State and Federal personnel, not merely an assemblage of unilateral products prepared by the Federal agencies in their respective fields. The Subcommittee decided that the Work Groups were to prepare detailed outlines of the five fields defined in the scope statement, with preliminary outlines to be ready for the Subcommittee on October 10.

On October 10 the five outlines were reviewed and edited and the Chairman of the Subcommittee asked the Work Group Chairmen to revise their outlines prior to reproduction and distribution. When this had been done, the outlines were presented to MBIAC at its December 10th meeting. Action was deferred to give members of the Committee adequate time to review the outline and so that the estimate of costs and time schedule would be available to the Committee.

Work Groups prepared estimates of costs of their portions of the study by individual items. These were reviewed by the Subcommittee and adjusted. The total estimated cost was $5,853,000, with an estimated completion date of 1969. The Subcommittees furnished estimates to MBIAC in advance of the Committee's January 30th meeting, and on the basis of these estimates representatives of the Federal Agencies prepared a revised, coordinated budget report.

At the Missouri Basin Inter-Agency Committee meeting in Houston, Texas January 30, the Subcommittee report was presented and discussed. Mr. Henry Caulfield of the Interdepartmental Staff Committee reported that the committee had initiated

drafting of guidelines for framework studies. He suggested that some modification of the Missouri Basin study outline might be desirable after the national guidelines were completed. The Missouri Basin Inter-Agency Committee continued the Subcommittee on Comprehensive Basin Planning to review the guidelines, making such refinements in the outline as appeared appropriate, and reporting at the next meeting of the Committee.

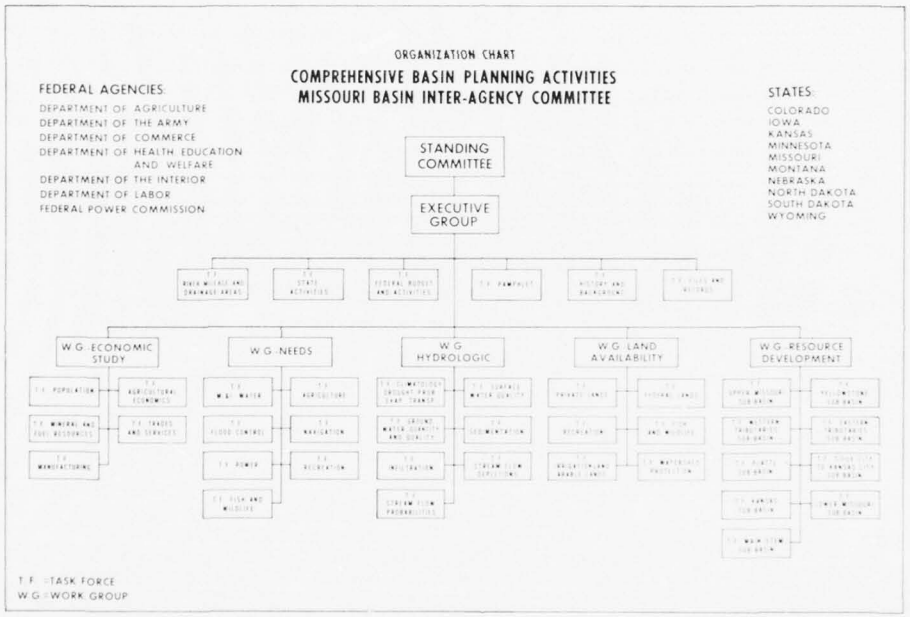
Further input from the Interdepartmental Staff Committee was furnished with copies of its Guidelines for Framework Studies dated February 10, 1964. The Staff Committee had found that some parts of the study outline proposed a degree of detail in excess of that advocated in the Guidelines. In addition, the Staff Committee had consummated a Memorandum of Understanding with the Department of Agriculture and the Office of Business Economics of the Department of Commerce relative to undertaking national economic studies and regional disaggregation. The nature of the studies was not explicitly defined. At the meeting of MBIAC in Bennett Springs, Missouri on April 23rd, the Subcommittee Chairman reported that some further suggestions had been received relative to the outline. The Committee instructed the Subcommittee to:

1. Finalize the outline in accord with the suggested guidelines from the Ad Hoc Committee in Washington.
2. Determine the scope, detail, and types of breakdowns of data to be obtained from the Department of Commerce study and the Department of Agriculture study.
3. Determine subbasin boundaries.
4. Determine the counties in the Missouri Basin and subbasins.
5. Determine the type of organization necessary to complete the study.
6. Formulate a time schedule for completion of the study.
7. Define the term "Related Land Resources."
8. Submit a wrap-up report to MBIAC at the forthcoming Billings meeting.

CHAPTER 3

THE STUDY IS AUTHORIZED

After further meetings of the Subcommittee and meetings of some Work Groups, a report was prepared and presented at the MBIAC meeting on June 17, 1964 in Billings. In response to the Committee's request, the Subcommittee report included a revised outline, the additional findings requested, and a copy of the guidelines constraining the detail of future studies. The Subcommittee report included the minutes of a meeting of the Economic Work Group, with representatives of the Office of Business Economics and Department of Agriculture, concerning information to be prepared on a national level. These data were to include income, employment, and population projections with a 32-industry breakdown on the first two items. The report recommended that the Missouri Basin be divided into nine areas for study purposes. These were: Upper Missouri; Yellowstone; Western Dakota; Eastern Dakota; Platte-Niobrara; Middle Missouri; Kansas; and Lower Missouri subbasins, and the Main Stem. A table was prepared showing counties to be included in the Missouri Basin Economic Studies to approximate the subbasin delineations. These county aggregations for Subbasins were termed Subregions. A proposal was attached to the report outlining the organization of the study staff, the backbone of which would be the five Work Groups which had already been established. The report contained a tentative schedule of activities, and recommended that the name of the Subcommittee be changed to "Standing Committee on Comprehensive Basin Planning." The Missouri Basin Inter-Agency Committee approved the Subcommittee's report, after which the States and Agencies each announced the name of its representative on the Standing Committee.


ORGANIZATION CHART
COMPREHENSIVE BASIN PLANNING ACTIVITIES
MISSOURI BASIN INTER-AGENCY COMMITTEE
FEDERAL AGENCIES:
DEPARTMENT OF AGRICULTURE
DEPARTMENT OF THE ARMY
DEPARTMENT OF COMMERCE
DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
DEPARTMENT OF THE INTERIOR
DEPARTMENT OF LABOR
FEDERAL POWER COMMISSION
STATES:
COLORADO
IOWA
KANSAS
MINNESOTA
MISSOURI
MONTANA
NEBRASKA
NORTH DAKOTA
SOUTH DAKOTA
WYOMING
STANDING COMMITTEE
EXECUTIVE GROUP
W.G.-ECONOMIC STUDY
W.G.-NEEDS
W.G.-HYDROLOGIC
W.G.-LAND AVAILABILITY
W.G.-RESOURCE DEVELOPMENT
T.F.-TASK FORCE
W.G.-WORK GROUP

CHAPTER 4

STUDY PROGRESS BY YEARS

FIRST YEAR (FISCAL YEAR 1965)

The Standing Committee on Comprehensive Basin Planning, established by the Missouri Basin Inter-Agency Committee in June 1964, consisted of one representative each from the 10 basin States and the 7 Federal Departments participating in MBIAC at that time. At the initial meeting of the Standing Committee, the concept of five Work Groups, representing the five major parts of the report outline, was reaffirmed; three had already started their work and the other two were activated. The Standing Committee agreed to meet regularly about four times a year, with such special meetings at other times as appeared necessary. An Executive Group, composed of representatives of four Federal Departments and two State representatives chosen by the ten States, was established to carry out the policies of the Standing Committee through more frequent meetings, oversee the overall study, provide guidance to the Work Groups, and accomplish other staff work for the full Committee.

The major job of accomplishing the actual study was assigned to the Economic Work Group, Needs and Problems Work Group, Hydrologic Projections Work Group, Land Availability Work Group, and Resource Development Work Group. Each of the Work Groups established and assigned work to Task Forces. Certain other Task Forces were established directly under the Standing Committee to assist in accomplishing special facets of the work retained by the Standing Committee. The work of the individual Work Groups will be covered in subsequent paragraphs.

The Standing Committee established five Task Forces initially:

1. The Task Force on Federal Activities served primarily to prepare the annual coordinated Federal budget for the study.
2. The Task Force on State Activities was established to promote coordination among the States. In addition, this Task Force was asked to prepare information concerning State laws, policies, procedures, and rulings which were pertinent to basin planning.
3. The third Task Force was to prepare a pamphlet which would explain the existing situation and what the framework study was to accomplish. It invited participation by basin residents in the framework planning activities. Approximately 50,000 copies of the pamphlet were printed for early distribution.
4. The fourth Task Force prepared a history and background of water resource development within the Missouri Basin.
5. The fifth Task Force was to compile River Mileages and Drainage Areas.

During the year, each of the Work Groups started work by reviewing the study outline and preparing an individual schedule. After these were coordinated it became apparent, because of the inter-relation among the various Work Groups and Task Forces, that a more detailed schedule utilizing the critical-path method or the Program Evaluation Review Technique should be prepared. The outline itself was found to be quite complete and in usable form. Supplementing the study outline, a tentative outline of the report was assembled by the Work Group Chairmen and coordinated by the Executive Group to help limit studies only to those required for the framework study.

Economic Work Group

Early activities included establishment of several Task Forces organized to deal with such topics as population, income, agriculture, mineral resources, manufacturing, trades and services, transportation, and similar items. In addition, representatives of the various Task Forces began studies of the disaggregation of region-wide or subregion totals into smaller components useful for planning. The future projections which were to be obtained from OBE had not been received, but utilizing historical data, disaggregation techniques were considered. This included possible use of input-output studies, but it was found that these probably were more detailed than was appropriate for the framework study; hence, they were not used. The Population Task Force prepared a summary and analysis of historical population with the breakdown to urban, rural non-farm, and rural farm. In addition to the regional and subregional breakdowns, the standard metropolitan statistical areas

were broken out as separate units for study purposes. Other Task Forces prepared employment and income data for 32 industrial segments for use in connection with disaggregation and as an index of the existing situation from which to make projections.

Needs and Problems Work Group

The following Task Forces were established: Agriculture, Navigation, Power, Municipal and Industrial Water, Flood Control, Recreation, and Fish and Wildlife. The Task Force on Power created an Industry Advisory Committee made up of people in the power business to assist. Most of the Task Forces established liaison with interested State agencies.

Hydrologic Projections Work Group

Seven Task Forces were created to fit the major elements in the outline of study:

1. Task Force on Climatology, Drought Probability, Evapotranspiration, and Weather Modification.
2. Ground-water Quantity and Quality.
3. Surface Water Quality.
4. Sedimentation.
5. Infiltration.
6. Streamflow Depletions.
7. Generalized Streamflow Probabilities

As the Task Forces set to work, concern was expressed that not enough attention had been paid to the potential for ground-water use in water resource development and that inadequate data were available. It was decided that the Ground-water Task Force would gather the data that were readily available, recognizing that they could not utilize all of the detail available from some States. In addition, they would consider further studies and field investigations beyond those needed for the framework study that might be necessary to provide essential data for future detailed studies. The Task Force on Generalized Streamflow Probabilities assembled the records of about 500 streamflow stations in and adjacent to the Missouri Basin and prepared data to be utilized by electronic computers to determine high flow, low flow, and flow-duration summaries for each of the stations with 10 years or more of streamflow record. This data was needed early in the schedule so it could be used in determining the framework plan. Moreover, after the framework plan was completed, the Task Force would then need to analyze remaining water availability in each of the subregions.

Land Resources Availability Work Group

Work was started with two Task Forces — one on Federal Lands and one on Private Lands.

Water and Related Land Resource Development Work Group

The Work Group was organized with nine Task Forces — one each for the eight subbasins and one for the Main Stem, Missouri River. Several meetings were held to provide guidance for other Work Groups on the data needed for the planning activities.

In general, the basic organization which had been assembled to draft the outline of study was continued. In a few instances, it was necessary to make changes of representation and in all Work Groups additional people were assigned, particularly by the States. Membership on the Work Groups and the Task Forces was made available to a representative of each Federal agency or State which felt it could make a contribution. As a rule, there was fine cooperation in the undertaking by all participants, both Federal and State. Personnel were usually those whose regular assignments were in related work and who continued in those assignments, bringing to the Work Groups and Task Forces the information which had been developed by their agencies. Only a few people were assigned full time to the framework study. During the first year, there were some problems of adequate financing for participation in certain fields, and efforts were made to remedy this.

SECOND YEAR (FISCAL YEAR 1966)

The Water Resources Planning Act of 1965 provided for comprehensive framework studies of all river basins in the United States and created the Water Resources Council to effectuate the policy of the Act. The Missouri Basin Comprehensive Framework Study, already underway, came within the purview of the Act, and progress on the Study was conducted, thereafter, within the policy guidelines of the Water Resources Council.

As the Standing Committee completed its second full year of work in June 1966, it reported to the Missouri Basin Inter-Agency Committee that very good progress had been made on the comprehensive study. The Standing Committee had met five times during the year. One of these meetings was with representatives of the Interdepartmental Staff Committee of the Water Resources Council in Washington where guidelines for framework studies and additional guidelines being prepared by the Interdepartmental Staff Committee were discussed, as was progress on the Missouri Basin Study. The other four meetings were to keep the Standing Committee apprised of the progress being made and any problems arising in the course of the study. During the year, the schedule for the study had been firmed up and two Program Evaluation and Review Technique charts prepared: One covering the overall study, in August 1966, and a more detailed schedule for each of the nine subbasins, in January 1966.

The five Task Forces operating directly under the Standing Committee reported the following activities:

1. Task Force on Federal Activities met and prepared budget estimates as required.
2. Task Force on State Activities had several discussions relative to the summarization of State Water Laws and two State drafts were prepared.
3. Task Force on the Pamphlet completed the initial distribution.
4. Task Force on History of the Missouri Basin assembled data and appeared to be progressing satisfactorily in drafting this appendix.
5. Task Force on River Mileages and Drainage Areas assembled and published information, with comprehensive coverage of the basin, and, thus, concluded its assignment.

Economic Work Group

Upon receipt of national projections disaggregated to the Missouri Basin or Region, the Group made an analysis overall with respect to employment, income, and population. The Task Forces of the Work Group proceeded with further breakdown of the disaggregrated national projections to the various subregions. During the year the Lower Missouri Subbasin and the Yellowstone Subbasin technical papers were completed.

Needs and Problems Work Group

While waiting for the economic data by subregions, the Group completed its analysis of historical data, and upon receipt of the national totals, made preliminary projections of needs for the total Missouri Basin. In addition, the Task Forces were engaged in their determination of needs in the initial subbasin – the Lower Missouri. Work was also in progress on the Yellowstone and Platte subbasins, using preliminary information furnished by the Economic Work Group.

Hydrologic Projections Work Group

Completed climatological studies on precipitation included 1-, 2-, 4-, and 8-week occurrences, with probability levels of 10, 50, 80, and 95 percent chances of occurrence. Multi-annual precipitation studies were also underway, together with drought probability studies. A technical paper summarizing streamflow characteristics for 54 stations in the Lower Missouri Subbasin had been distributed. Associated high-volume probability curves were being readied for publication. Similar studies for other subbasins were in progress. Surface-water quality maps had been prepared for the Lower Missouri Subbasin and similar maps were underway for other subbasins. Ground-water maps showing general availability and other information were prepared.

Land Resources Availability Work Group

This Work Group was restructured to include five Task Forces. Base maps were prepared by the Land Uses Task Force for the entire Missouri Basin and for individual subbasins, showing land resource areas and soil groupings. A Recreation Task Force prepared an analysis of land and water areas within the Lower Missouri and Yellowstone subbasins and was working on those in the Platte Subbasin. The Fish and Wildlife Task Force had prepared an analysis of land available and adaptable to wildlife in the first two subregions. An Irrigation and Arable Lands Task Force was reviewing potentially irrigable areas. A new task force was created on Watershed Protection and initiated collection of data on watershed projects.

Water and Related Land Resource Development Work Group

Guidelines were prepared enabling Task Forces to proceed upon the availability of data from other Work Groups. These Task Forces for subbasin planning consisted of representatives of the principal constructing agencies of the Federal Government, together with representatives of the States involved in given subbasins. The guidance materials which had been prepared for these Task Forces included a modus operandi and objective guides for the framework study.

THIRD YEAR (FISCAL YEAR 1967)

During the third year, progress was good, although the study did not fully attain its schedule. The Standing Committee met four times to review progress and resolve problems. By the end of the year approximately 65% of the study had been completed. The Executive Group met several times to deal with problems and to assist in moving the study along. It also undertook the preparation of Editorial Standards and Outlines for the report and appendices and prepared a Glossary of Terms. The Task Force on Federal Activities prepared the coordinated budget required for Federal agencies. The Task Force on State activities continued with its work of assembling information relative to State Water laws. The Task Force on Historical Background completed its draft appendix.

Economic Work Group

Some of the problems encountered during the year were associated with efforts to disaggregate regional

totals to the various subregions. Adjustments in the subregions were attempted, but some objections arose since it was felt there might need to be further adjustment among the regions after the initial disaggregation had been accomplished. Part of the problem stemmed from the disaggregation between the densely populated areas, such as Standard Metropolitan Statistical Areas (SMSA's), and the less-populated rural areas. Another problem was the matching of agricultural production requirements, which had been prepared for the regions and could be disaggregated to the subregions, with agricultural productive capability. The latter was not yet available due to the work needed to project the future production capability of various land classes, the future feed requirements, and how these related to requirements for agricultural production in the various subregions. Nevertheless, four subregional technical papers were completed during the year, on the Platte, Middle Missouri, Western Dakota, and Upper Missouri subregions.

Needs and Problems Work Group

Difficulty was encountered in maintaining schedules, primarily because long-term needs projection was a relatively new field and because sufficient data were not available in certain areas. In preparing technical papers, the seven Task Forces found that problems arose in combining their several outputs into a consistent subbasin report. After considerable effort the technical papers on the Lower Missouri Subbasin were completed, at the same time establishing procedures to allow future technical papers to be prepared more readily. Papers on the Lower Missouri, Yellowstone, and Platte River subbasins were then begun. An Ad Hoc Task Force on Efficiency of Irrigation Systems was established and undertook a study of the existing systems in the three principal subbasins where irrigation is carried on — Yellowstone, Platte, and Upper Missouri. Two of the technical papers were essentially completed with a third area under active study.

Hydrologic Projections Work Group

At the end of this year the Hydrologic Work Group had completed 33 of the technical papers and all others were well under way. Most of the papers regarding climatology and related studies were prepared, at least in draft form, and reviewed. With respect to surface water supply, streamflow tables and depletion estimates had been completed for four of the eight subbasins. Additional streamflow data concerning duration tables and high and low-flow values were completed for seven of the nine subbasins and high flow-volume frequency curves and generalized flood frequency relationships were completed for three subbasins. Two basinwide papers, one on mean annual runoff, and the other on infiltration, were completed. Five basinwide maps delineating surface-water quality characteristics were prepared. Ground-water data were being assembled for preparation of a basin map as a guide in the planning effort. It was anticipated, however, that because of the nature of ground water, further detailed consultation with members of the Ground-water Task Force would be required.

Land Resources Availability Work Group

The previous Task Forces on Federal and Private Lands essentially completed their work and the five active Task Forces on Land Uses, Irrigation and Arable Lands, Watershed Protection, Recreation, and Fish and Wildlife completed technical papers on five subbasins with three others under active preparation.

Water and Related Land Resource Development Work Group

Task Force organization for planning was completed and although it had been anticipated that the various regional planning efforts would be sequential, it appeared they would need to be more or less concurrent; assignment of personnel to the Task Forces was accomplished on this basis.

During the year, the Missouri Basin Inter-Agency Committee assigned to the Standing Committee preparation of Chapter X, Part VI of the Water Resources Council Biennial Assessment. The initial draft of this chapter was prepared, reviewed by the Standing Committee and its various Work Group chairmen, and the Committee. It was revised and submitted to the Water Resources Council.

FOURTH YEAR (FISCAL YEAR 1968)

During the fourth year of the study, essentially all the technical papers of the Economic Work Group, Needs and Problems Work Group, Hydrologic Projections Work Group, and the Land Availability Work Group were completed and made available for use by the Resource Development Work Group and its Task Forces. Initial drafts of the appendices on the Economic Study and on Needs and Problems had been prepared and work was under way on the Land Availability and Hydrology Appendices. In the Standing Committee Report to MBIAC at the end of the fourth year, the Work Group Chairmen reported some of the preliminary findings which were extracted from the technical papers, and the Resources Development Work Group summarized some of the studies which were under way on one subbasin.

FIFTH YEAR (FISCAL YEAR 1969)

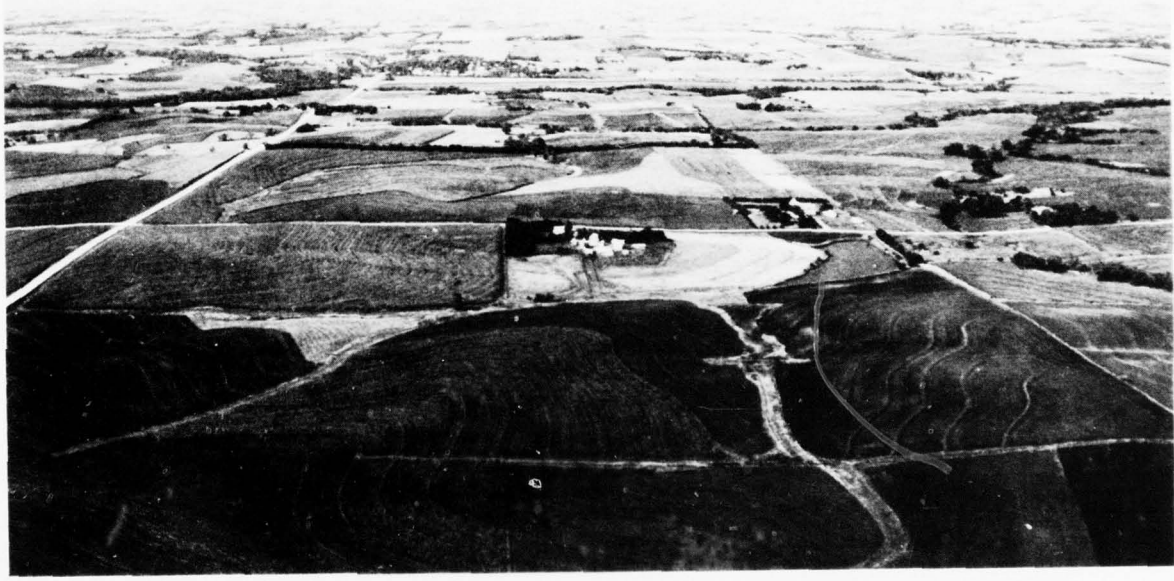
During the fifth year, the Resource Development Work Group put together its initial plan and a set of Preliminary Findings was printed early in May. This pamphlet was utilized in meetings held with State agencies in Kansas on May 6th; Nebraska on May 21st; Minnesota on June 4th; and North Dakota on June 5th. In addition, public meetings were scheduled – the first held in Kansas City for the states of Kansas and Missouri on May 28th; one at Billings, Montana, on June 12th; Council Bluffs, Iowa, June 17th; Bismarck, North Dakota, June 18th; Lincoln, Nebraska, June 19th; and Denver, Colorado, June 24th. During the year, the initial drafts of appendices on Economics, Needs and Problems, Land Availability, and Hydrology were reviewed and preparation of the main report was under way, utilizing the drafts of appendices.

SIXTH YEAR (FISCAL YEAR 1970)

During the sixth year, meetings were held with State representatives in South Dakota on July 2nd and in Wyoming on July 8th. Public meetings were held at Pierre, South Dakota on July 3rd and Casper, Wyoming on July 9th. This completed the round of meetings with State agencies and the public meetings, one being held for each State. During the year, the Appendix on History of the Basin and Appendix on Laws were made printer-ready. The appendices on Economics and Hydrology were essentially complete. The appendices on Needs and Problems and Water and Related Land Resource Development were in their final stages of revision. The Main Report was brought to about 75 percent completion. During the year consideration was given to follow-on studies of the Level B scope and the Standing Committee recommended three areas to the Inter-Agency Committee: The Platte River Basin in Nebraska, the James River Basin in North and South Dakota, and the Nishnabotna River Basin in Iowa. Initial arrangements were made with the Government Printing Office to handle final composition and printing of the overall report and appendices.

SEVENTH YEAR (FISCAL YEAR 1971-1972)

During calendar year 1971 the various appendices and the main report were completed, edited, and made ready for the printer. A formal agreement was entered into with the Government Printing Office for composition and printing, and specifications were drawn to accomplish contract composition. The appendices and report were printed and available for distribution early in calendar 1972.



CHAPTER

IN RETROSPE

In reviewing the overall history of the study one must remark upon the sincerity, friendliness, and cooperative attitude of all the people involved. Although the members of the Inter-Agency Committee recognized the need for a comprehensive reexamination of basin development when it was first recommended, there was some reluctance to begin. One of the factors which led to this hesitancy on the part of the States doubtless was the wish for greater lead time so they could program an appropriate level of participation in the study. In spite of this, the activities of the State representatives in the framework study undertaking were outstanding.

The insistence on the part of the States that the study not be a series of unilateral plans by the principal Federal agencies which were merely added together, but rather that the planners develop a truly coordinated plan led to the way in which the study was undertaken. From the beginning, multi-agency and State groups undertook each assigned phase of the study. In all instances the agencies and the States had representatives on those Work Groups and Task Forces in which they were particularly concerned, and to which they thought they could make a material contribution.

As the framework study was a relatively new early efforts to assemble and analyze data proc some information which was not fully used durin framework planning effort. However, most of information was recorded in the technical paper will be useful in further, more detailed studies. nature of the planning effort and its requirement been fully recognized earlier, some work could been eliminated and other work channeled to mak results more useful.

In the final appraisal, the success of the study m ascribed to the fact that the MBIAC had a long hi of cooperative undertakings before this study initiated, and that the activities of the MBIAC had a broad understanding on the part of the prin concerning water and related land resource develop The organization patterns of the Standing Comm the Executive Group, and the Task Forces w reported directly to the Standing Committee are list follows. Membership of the five Work Groups an Task Forces reporting to them is presented in Appendix to which the Work Group contributed.

STANDING COMMITTEE

Gus J. Karabatsos, Chairman	6/71 – Present	Dept. of the Army, Corps of Engrs.
Charles A. Cocks, Chairman	6/64 – 5/71	Dept. of the Army, Corps of Engrs.
J. W. Grimes, Vice Chairman	6/64 – Present	State of South Dakota
William B. Patterson	7/71 – Present	Dept. of Agriculture
Allen L. Fisk	1/67 – 6/71	Dept. of Agriculture
C. Dale Jaedicke	6/64 – 12/66	Dept. of Agriculture
Elroy C. Balke	6/71 – Present	Dept. of Commerce
Verne Alexander	6/64 – 5/71	Dept. of Commerce
Robert A. Kay	3/71 – Present	Dept. of Health, Education and Welfar
T. C. Ferris	1/69 – 2/71	Dept. of Health, Education and Welfar
Aleck Alexander	9/67 – 12/68	Dept. of Health, Education and Welfar
Joseph W. Fitzpatrick	6/67 – 8/67	Dept. of Health, Education and Welfar
Frederick K. Erickson	6/66 – 5/67	Dept. of Health, Education and Welfar
Lewis A. Young	6/64 – 5/66	Dept. of Health, Education and Welfar
B. E. Stephenson	10/70 – Present	Dept. of Housing & Urban Developmer
Paul L. Harley	1/67 – Present	Dept. of the Interior
Paul Berg	7/66 – 11/66	Dept. of the Interior
Bruce Johnson	6/64 – 6/66	Dept. of the Interior
Charles E. Mooney	6/66 – 6/71	Dept. of Labor
K. M. Kingsbury	6/64 – 5/66	Dept. of Labor
Capt. William L. Webster	9/70 – Present	Dept. of Transportation
Lewis A. Young	3/71 – Present	Environmental Protection Agency
Lenard B. Young	10/65 – Present	Federal Power Commission
Kenneth E. Tower	6/64 – 9/65	Federal Power Commission
Stanley A. Miller	6/64 – Present	State of Colorado
Othie R. McMurry	10/69 – Present	State of Iowa
H. Garland Hershey	6/64 – 9/69	State of Iowa
John M. Dewey	6/64 – Present	State of Kansas
Roger Franke	8/71 – Present	State of Minnesota
Gale H. Chapman	6/64 – 7/71	State of Minnesota
Clifford L. Summers	6/64 – Present	State of Missouri
Wilbur White	6/64 – Present	State of Montana
Dayle Williamson	11/70 – Present	State of Nebraska
Warren Fairchild	6/67 – 10/70	State of Nebraska
Dan S. Jones, Jr.	6/64 – 5/67	State of Nebraska
Milo W. Hoisveen	6/64 – Present	State of North Dakota
George L. Christopulos	6/64 – Present	State of Wyoming

EXECUTIVE GROUP

Gus J. Karabatsos, Chairman	6/71 – Present	Dept. of the Army, Corps of Engr
Charles A. Cocks, Chairman	6/64 – 5/71	Dept. of the Army, Corps of Engr
William B. Patterson	7/71 – Present	Dept. of Agriculture
Allen L. Fisk	1/67 – 6/71	Dept. of Agriculture
C. Dale Jaedicke	6/64 – 12/66	Dept. of Agriculture
Robert A. Kay	3/71 – Present	Dept. of Health, Education and W
T. C. Ferris	1/69 – 2/71	Dept. of Health, Education and W
Aleck Alexander	9/67 – 12/68	Dept. of Health, Education and W
Joseph W. Fitzpatrick	6/67 – 8/67	Dept. of Health, Education and W
Frederick K. Erickson	6/66 – 5/67	Dept. of Health, Education and W
Lewis A. Young	6/64 – 5/66	Dept. of Health, Education and W
Paul L. Harley	1/67 – Present	Dept. of the Interior
Paul Berg	7/66 – 12/66	Dept. of the Interior
Bruce Johnson	6/64 – 6/66	Dept. of the Interior
John M. Dewey	6/64 – Present	State of Kansas
J. W. Grimes	6/64 – Present	State of South Dakota

TASK FORCE ON STATE ACTIVITIES

J. W. Grimes, Chairman	6/64 – Present	State of South Dakota
Stanley A. Miller	6/64 – Present	State of Colorado
Othie R. McMurry	10/69 – Present	State of Iowa
H. Garland Hershey	6/64 – 9/69	State of Iowa
John M. Dewey	6/64 – Present	State of Kansas
Roger Franke	8/71 – Present	State of Minnesota
Gale H. Chapman	6/64 – 7/71	State of Minnesota
Clifford L. Summers	6/64 – Present	State of Missouri
Douglas G. Smith	10/69 – 6/71	State of Montana
Everett Darlinton	9/67 – 9/69	State of Montana
A. D. McDermott	12/64 – 8/67	State of Montana
Wilbur White	6/64 – 11/64	State of Montana
Dayle Williamson	11/70 – Present	State of Nebraska
Warren Fairchild	6/67 – 10/70	State of Nebraska
Dan S. Jones, Jr.	6/64 – 5/67	State of Nebraska
Milo W. Hoisveen	6/64 – Present	State of North Dakota
George L. Christopulos	6/64 – Present	State of Wyoming

TASK FORCE ON FEDERAL BUDGETS

Charles A. Cocks, Chairman	Dept. of the Army, Corps of Engr
Harrell F. Mosbaugh	Dept. of the Interior
Allen L. Fisk	Dept. of Agriculture
T. C. Ferris	Dept. of Health, Education & Wel
Verne Alexander	Dept. of Commerce
Charles E. Mooney	Dept. of Labor
Lenard Young	Federal Power Commission

TASK FORCE ON PAMPHLET

Allen L. Fisk, Chairman	Dept. of Agriculture
Paul L. Harley	Dept. of the Interior
H. Garland Hershey	State of Iowa
Charles A. Cocks	Dept. of the Army, Corps of Engr

TASK FORCE ON HISTORICAL AND BACKGROUND INFORMATION

Paul L. Harley	Dept. of the Interior
Allen L. Fisk	Dept. of Agriculture
Charles A. Cocks	Dept. of the Army, Corps of En

TASK FORCE ON FILES AND RECORDS

Paul L. Harley	Dept. of the Interior
Clifford L. Summers	State of Missouri
Allen L. Fisk	Dept. of Agriculture

TASK FORCE ON DRAINAGE AREAS AND RIVER MILEAGE

Lamar E. Carroon	U. S. Geological Survey
William Northrop	Dept. of the Army, Corps of En
Richard Leisher	Dept. of Agriculture
Walter F. Robohn	Federal Water Pollution Control

TASK FORCE ON FEDERAL WATER LAWS AND POLICIES

A. E. Bielefeld, Chairman	Dept. of the Interior
C. H. Penstone	Dept. of Agriculture
L. A. Chotena	Dept. of Agriculture
H. B. Weber	Dept. of the Army, Corps of En
H. M. Voigat	Dept. of the Army, Corps of En

COMPREHENSIVE FRAMEWORK S
MISSOURI RIVER BASIN

APPENDIX

EXISTING WATER AND

LAND RESOURCES DEVELOPMENT

MISSOURI BASIN INTER-AGENCY COMMITTEE

JUNE 1969

CONTENTS

TABLES

FIGURES

PLATES

PHOTOGRAPHS

The photographs included in this appendix were furnished by:

AD-A043 936 MISSOURI BASIN INTER-AGENCY COMMITTEE F/G 8/6
COMPREHENSIVE FRAMEWORK STUDY MISSOURI RIVER BASIN. VOLUME 2. A--ETC(U)
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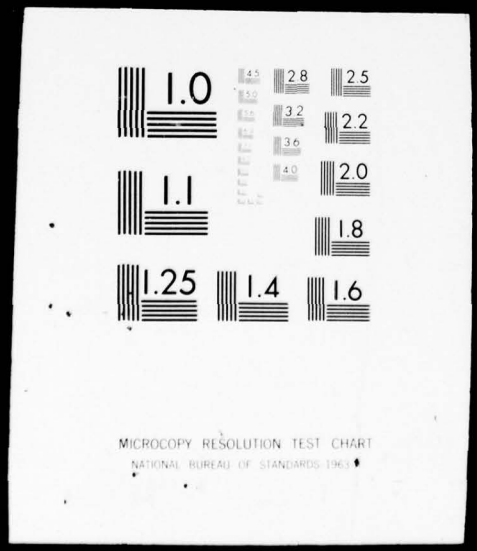

CONTENTS (Continued)

CHAPTER 1

EXISTING SITUATION

The planning of water and related land resource development for the future must be related to the current level of development. This appendix, "Existing Water and Land Resources Development" was formulated to provide the base for the Comprehensive Framework Study. The base was considered to be those resource projects completed or under construction in 1969. Further, it is recognized that in some areas, such as the local and private sector, development could be assessed as individual units but is amenable to summarization by certain groupings.

Data on water and related land resource development in the Missouri River Basin were assembled from many sources. A tabulation contained in the Annual Report of the Missouri Basin Inter-Agency Committee for 1965 was utilized as the starting point. Original data in this report observed no restriction as to size of project or reservoir capacity. However, additional information gathered for this appendix on reservoirs was limited to those with 5,000 acre-feet capacity and above.

Other sources of data included direct inputs from the States and Federal agencies, as requested, and from the State water plans, as available. Also, publications of the U. S. Geological Survey on "Reservoirs of the United States" were utilized. Figure 1 shows the location of these projects insofar as practicable covering watershed projects, major reservoirs, urban local protection, streambank stabilization, agricultural levees, and average annual trans-basin water diversions.

Irrigation developments consisting of some major projects are listed in the data summary, table 1. However, many irrigation developments in the private sector affect only small areas and do not lend themselves to listing, but are shown on figure 2 along with the major developments.

As stated, certain improvements are small and numerous. These have been consolidated by subbasin and listed in table 1. Among these are the stock ponds, as indicated in the table, by total number and surface area for each subbasin. Sanitary sewage treatment plants are listed showing the number of communities and of systems in the subbasin, together with type of treatment – primary, secondary, or none. Major electric power plants are reported as individual items, with plants with less than 10,000 kw capacity listed only by number of hydro, steam, or internal-combustion plants by subbasin.

Water supply for the urban areas of each subbasin is based on a population breakdown showing only the number of systems for each level of population and total capacity by million gallons per day. The rural area is categorized by rural nonfarm serving a population of 2,500 and below, nonfarm – individual systems, and farm domestic – individual systems.

Major Federal, State, and local recreation areas are listed in each subbasin. Also, these are located by symbol on plate 1 as National Parks, Monuments, Historic Sites, National Forests, Wilderness or Primitive areas, National Wildlife Refuges, and major State and Federal Recreation areas. Other recreation areas including Public Domain, Indian Reservations and Settlements, and National Grasslands, with recreation areas pertinent to these and other State and local recreation areas, are shown on plate 2. State, Local, and Private Recreation areas are listed in table 1 as to number and the total acreage of land involved. Land conservation treatment on Public Domain land is summarized in table 1 for each subbasin in which located.

The data presented in table 1 depict the existing situation for water and related resource developments in the Missouri River Basin. Projects completed and under construction as of July 1, 1969 are shown for Federal, State, local, and private entities under conditions described earlier. Financial data have been included where available, showing total construction costs through Fiscal Year 1965, and annual expenditures for Fiscal Years 1966, 1967, 1968, and 1969. The estimated amount to complete project construction after Fiscal Year 1969 is also included. The starting date of construction and completion date are noted. A detailed explanation of column follows:

Column 1 – The name of each project. Listed by location, beginning upstream and proceeding downstream.

Column 2 – The stream on which the project is located or associated. In most cases where small tributaries are named, the parent stream is also given.


50°
115°
110°
105°
45°
40°
IMPORT
185,000 AF
SHELBY
HAVRE
MILK RIVER
MALTA
GLASGOW
WILLISTON
VAUGHN
SUN RIVER
GREAT FALLS
MISSOURI
1
WEST GLENDIVE
MEDORA
MISSOURI RIVER
MILES CITY
MARMARTH
FORSYTH
CLYDE PARK
BILLINGS
YELLOWSTONE
SCRANTON
JOLIET
BIG HOLE RIVER
JEFFERSON RIVER
MADISON RIVER
GALLATIN RIVER
2
3
TONGUE RIVER
SHERIDAN
RED ROCK RIVER
LOVELL
CODY
GREYBULL
BUFFALO
BELLE FOURCHE
BELLE FOURCHE RIVER
RAPID CITY
WORLAND
THERMOPOLIS
BIGHORN
POWDER
WIND
DUBOIS
HOT SPRINGS
CASPER
LANDER
CHADRON
SWEETWATER RIVER
SCOTTSBLUFF
5
LARAMIE
CHEYENNE
SIDNEY
IMPORT
6,000 AF
FORT COLLINS
HOLYOKE
EVANS
LONGMONT
BOULDER
FORT MORGAN
BRUSH
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GOLDEN
DENVER
ENGLEWOOD
MORRISON
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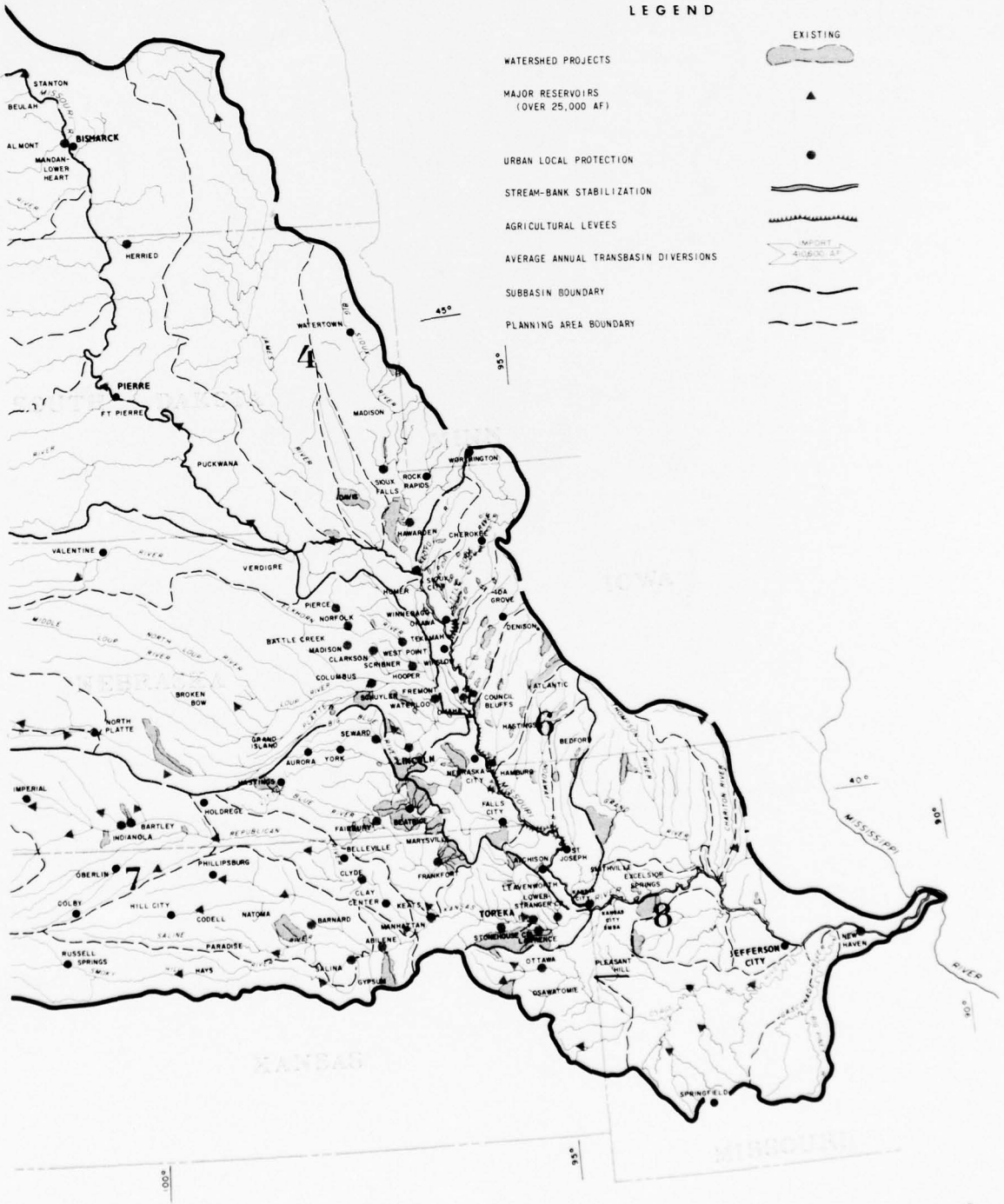
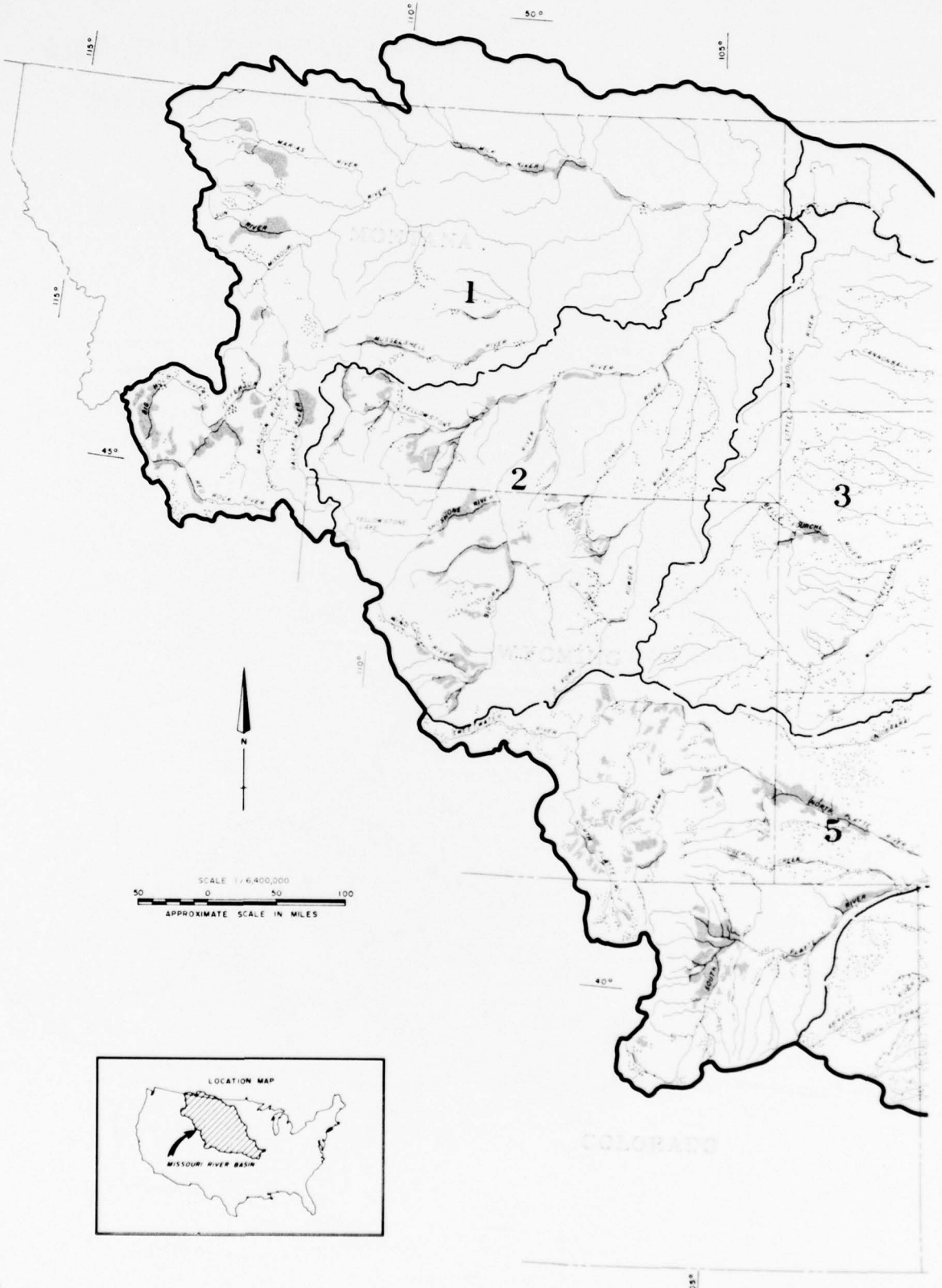
APPROXIMATE SCALE IN MILES
LOCATION MAP
MISSOURI RIVER BASIN

FIGURE 1

PRINCIPAL WATER CONTROL FEATURES

EXISTING OR UNDER CONSTRUCTION 1969

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APPROXIMATE SCALE IN MILES
LOCATION MAP
MISSOURI RIVER BASIN

FIGURE 2

EXISTING IRRIGATION DEVELOPMENT

EXISTING OR UNDER CONSTRUCTION 1969

Column 3 – The Federal or State agency, local entity, or private ownership which constructed or manages the project or development.

Column 4 – The function of the project, identified either as single or multiple-use.

Column 5 – A brief description of the project, with specific reference made to major features.

Column 6 – Total cost of project if constructed or estimated total cost if under construction, and where available.

Column 7 – Cost incurred through Fiscal Year 1965.

Column 8, 9, 10, 11 – Estimated expenditures for fiscal years 1966 through 1969 for projects under construction.

Column 12 – Estimated cost to complete the project after Fiscal Year 1969.

Column 13 – Date construction began.

Column 14 – Date project completed or estimated completion date.

The following abbreviations were utilized in table 1:

Functions

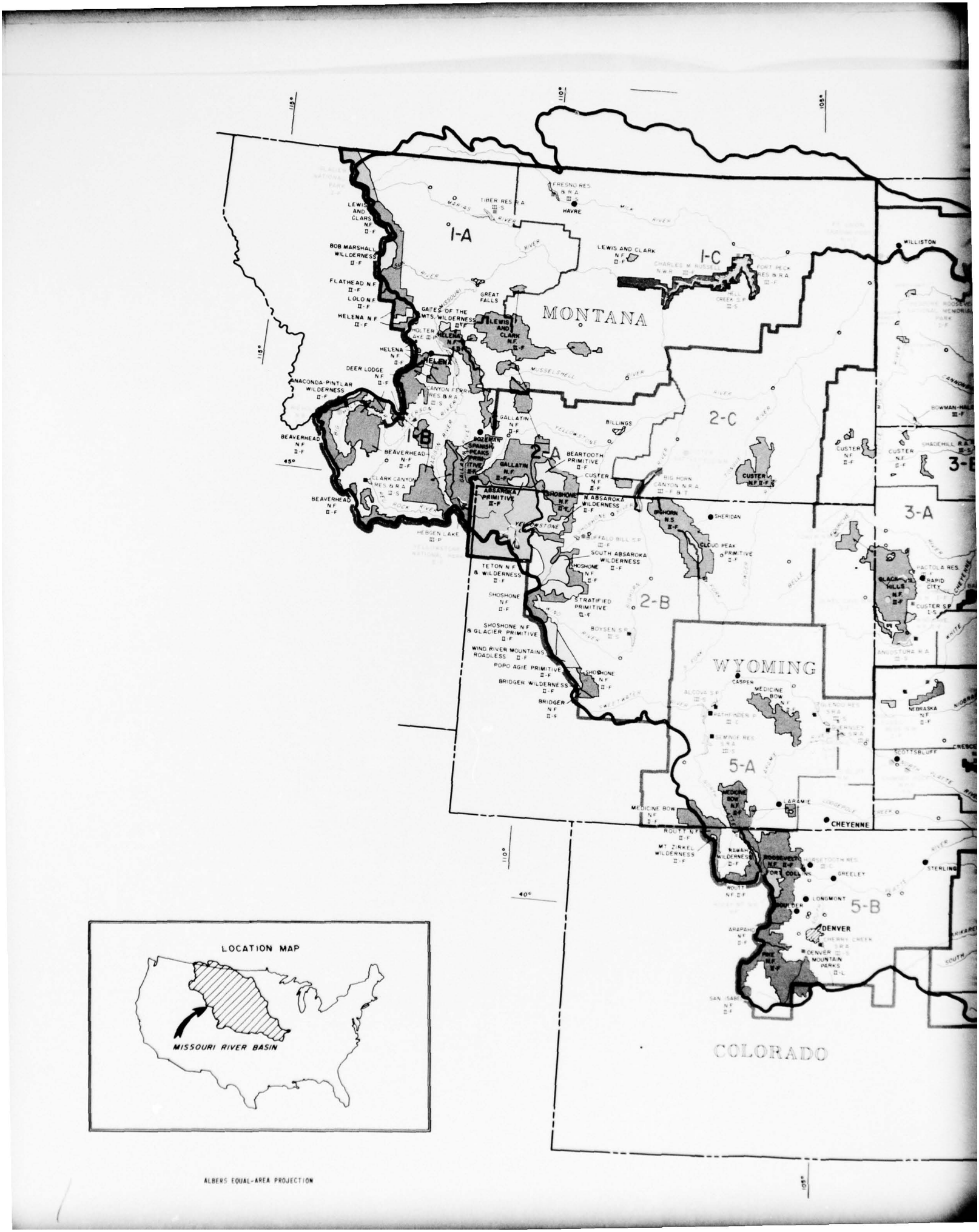
C – Channel Stabilization
D – Drainage
E – Erosion Control
F – Fish and Wildlife
FC – Flood Control & Detention
Fo – Forest
Gr – Grazing
I – Irrigation
M – Municipal & Industrial Water
N – Navigation
P – Power
R – Recreation
Rd – Rural Domestic Water
W – Water Quality Control
WP – Watershed Protection

Agency Abbreviation

SCS – Soil Conservation Service – Department of Agriculture
FS – Forest Service – Department of Agriculture
CE – Corps of Engineers – Department of Defense
BIA – Bureau of Indian Affairs – Department of the Interior
BLM – Bureau of Land Management – Department of the Interior
BR – Bureau of Reclamation – Department of the Interior
BSFW – Bureau of Sport Fisheries & Wildlife – Department of the Interior
NPS – National Park Service – Department of the Interior

State Abbreviation

Colo. – Colorado
Iowa – Iowa
Kans. – Kansas
Minn. – Minnesota
Mo. – Missouri
Mont. – Montana
Nebr. – Nebraska
S. Dak. – South Dakota
N. Dak. – North Dakota
Wyo. – Wyoming


MONTANA
WYOMING
COLORADO
1-A
1-B
1-C
2-A
2-B
2-C
3-A
3-B
5-A
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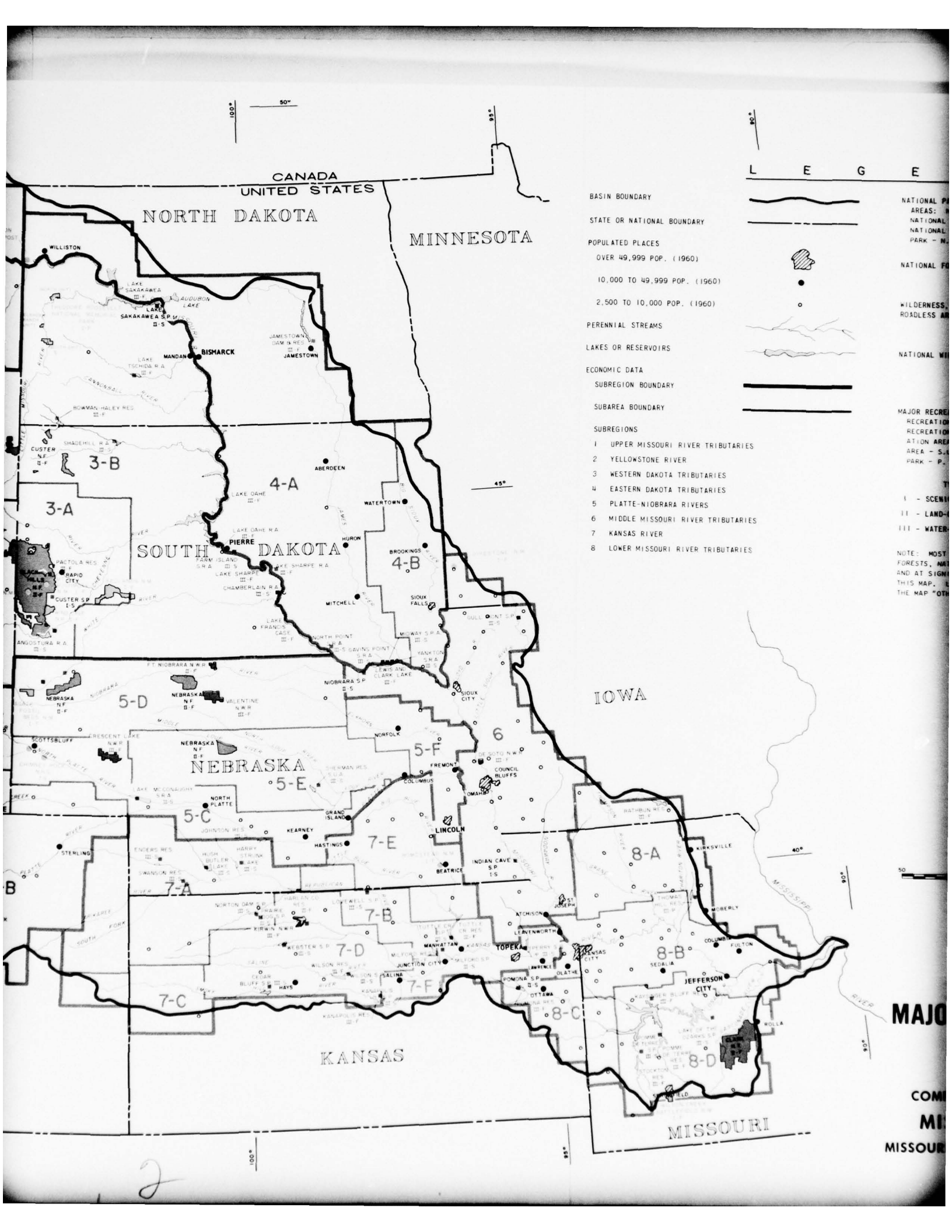
LOCATION MAP
MISSOURI RIVER BASIN
ALBERS EQUAL-AREA PROJECTION


CANADA
UNITED STATES
NORTH DAKOTA
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NEBRASKA
IOWA
KANSAS
MISSOURI
WILLISTON
BISMARCK
MANDAN
JAMESTOWN
ABERDEEN
WATERTOWN
PIERRE
HURON
BROOKINGS
MITCHELL
SIOUX FALLS
RAPID CITY
SIOUX CITY
NORFOLK
FREMONT
COUNCIL BLUFFS
OMAHA
COLUMBUS
LINCOLN
GRAND ISLAND
NORTH PLATTE
KEARNEY
HASTINGS
BEATRICE
SCOTTSBLUFF
STERLING
ATCHISON
ST JOSEPH
LEAVENWORTH
TOPEKA
MANHATTAN
JUNCTION CITY
SALINA
HAYS
KANSAS CITY
OLATHE
OTTAWA
POMONA S.P.
KIRKSVILLE
MOBERLY
COLUMBIA
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SEDALIA
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8-B
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8-D
100°
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L E G E
BASIN BOUNDARY
STATE OR NATIONAL BOUNDARY
POPULATED PLACES
OVER 49,999 POP. (1960)
10,000 TO 49,999 POP. (1960)
2,500 TO 10,000 POP. (1960)
PERENNIAL STREAMS
LAKES OR RESERVOIRS
ECONOMIC DATA
SUBREGION BOUNDARY
SUBAREA BOUNDARY
SUBREGIONS
1 UPPER MISSOURI RIVER TRIBUTARIES
2 YELLOWSTONE RIVER
3 WESTERN DAKOTA TRIBUTARIES
4 EASTERN DAKOTA TRIBUTARIES
5 PLATTE-NIOBRARA RIVERS
6 MIDDLE MISSOURI RIVER TRIBUTARIES
7 KANSAS RIVER
8 LOWER MISSOURI RIVER TRIBUTARIES
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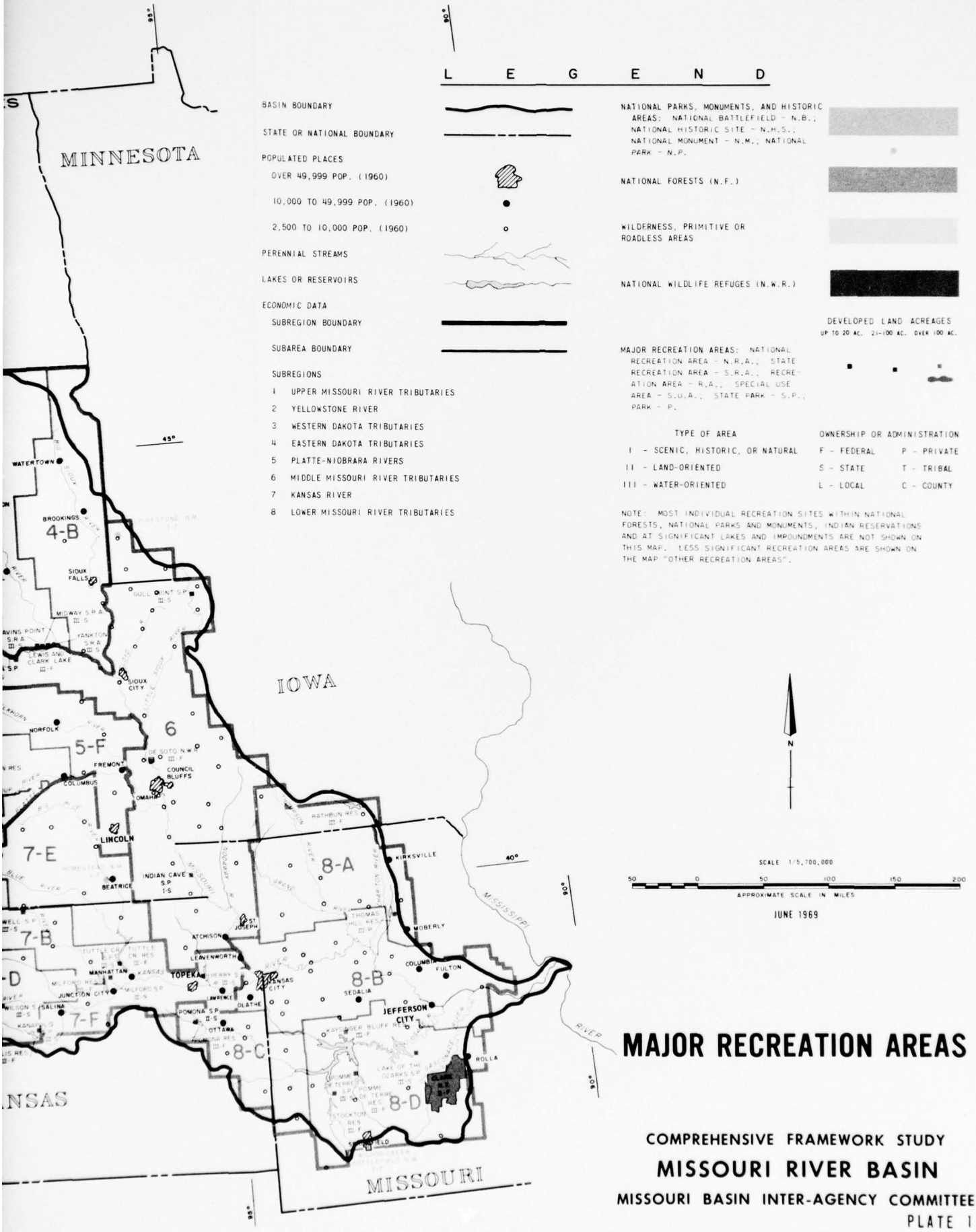

L E G E N D

BASIN BOUNDARY

STATE OR NATIONAL BOUNDARY

POPULATED PLACES

OVER 49,999 POP. (1960)

10,000 TO 49,999 POP. (1960)

2,500 TO 10,000 POP. (1960)

PERENNIAL STREAMS

LAKES OR RESERVOIRS

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7 KANSAS RIVER
8 LOWER MISSOURI RIVER TRIBUTARIES

NATIONAL PARKS, MONUMENTS, AND HISTORIC AREAS: NATIONAL BATTLEFIELD - N.B.; NATIONAL HISTORIC SITE - N.H.S., NATIONAL MONUMENT - N.M.; NATIONAL PARK - N.P.

NATIONAL FORESTS (N.F.)

WILDERNESS, PRIMITIVE OR ROADLESS AREAS

NATIONAL WILDLIFE REFUGES (N.W.R.)

DEVELOPED LAND ACREAGES
UP TO 20 AC. 21-100 AC. OVER 100 AC.

MAJOR RECREATION AREAS: NATIONAL RECREATION AREA - N.R.A.; STATE RECREATION AREA - S.R.A.; RECREATION AREA - R.A.; SPECIAL USE AREA - S.U.A.; STATE PARK - S.P.; PARK - P.

TYPE OF AREA	OWNERSHIP OR ADMINISTRATION	
I - SCENIC, HISTORIC, OR NATURAL	F - FEDERAL	P - PRIVATE
II - LAND-ORIENTED	S - STATE	T - TRIBAL
III - WATER-ORIENTED	L - LOCAL	C - COUNTY

NOTE: MOST INDIVIDUAL RECREATION SITES WITHIN NATIONAL FORESTS, NATIONAL PARKS AND MONUMENTS, INDIAN RESERVATIONS AND AT SIGNIFICANT LAKES AND IMPOUNDMENTS ARE NOT SHOWN ON THIS MAP. LESS SIGNIFICANT RECREATION AREAS ARE SHOWN ON THE MAP "OTHER RECREATION AREAS".

MAJOR RECREATION AREAS

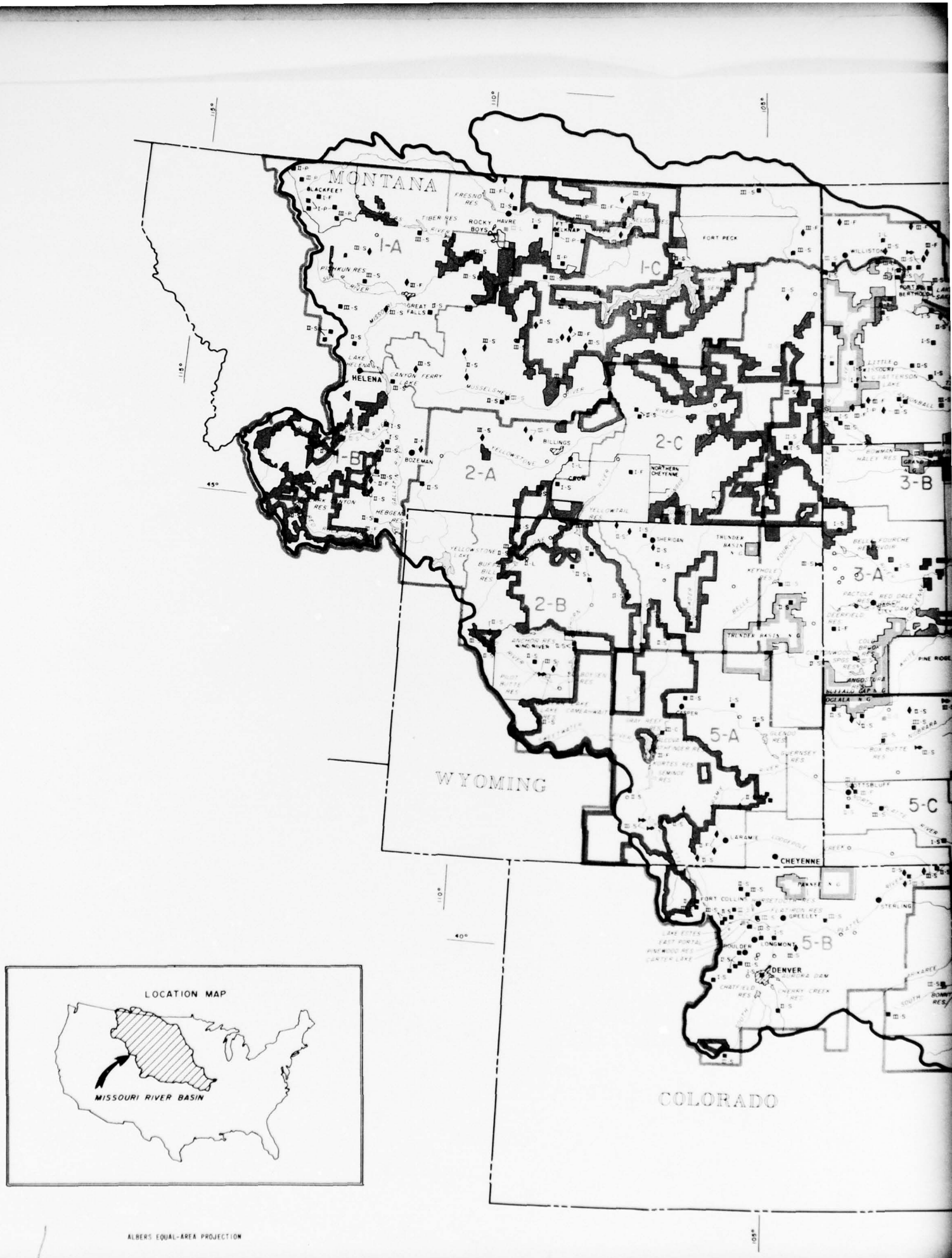
COMPREHENSIVE FRAMEWORK STUDY

MISSOURI RIVER BASIN

MISSOURI BASIN INTER-AGENCY COMMITTEE

PLATE 1

3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5-A
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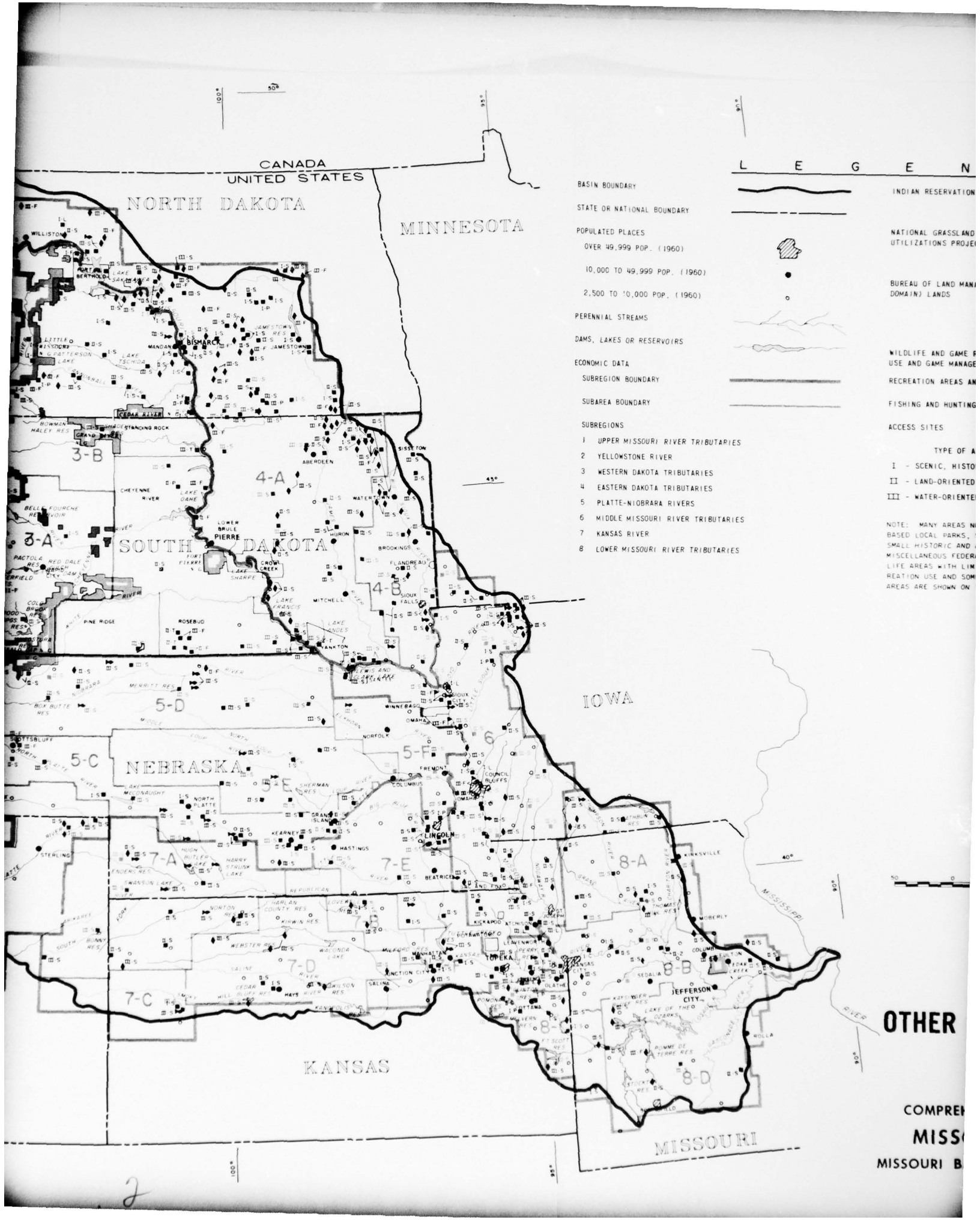
5-C
HELENA
BOZEMAN
BILLINGS
GREAT FALLS
CHEYENNE
DENVER
LOCATION MAP
MISSOURI RIVER BASIN
ALBERS EQUAL-AREA PROJECTION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JAMESTOWN
ABERDEEN
PIERRE
HURON
BROOKINGS
SIOUX FALLS
MITCHELL
YANKTON
SIOUX CITY
OMAHA
NORFOLK
FREMONT
COUNCIL BLUFFS
COLUMBUS
LINCOLN
GRAND ISLAND
HASTINGS
KEARNEY
NORTH PLATTE
BEATRICE
TOPEKA
KANSAS CITY
MANHATTAN
JUNCTION CITY
SALINA
HAYS
OLATHE
JEFFERSON CITY
SEDALIA
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8 LOWER MISSOURI RIVER TRIBUTARIES
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USE AND GAME MANAGE
RECREATION AREAS AN
FISHING AND HUNTING
ACCESS SITES
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II - LAND-ORIENTED
III - WATER-ORIENTE
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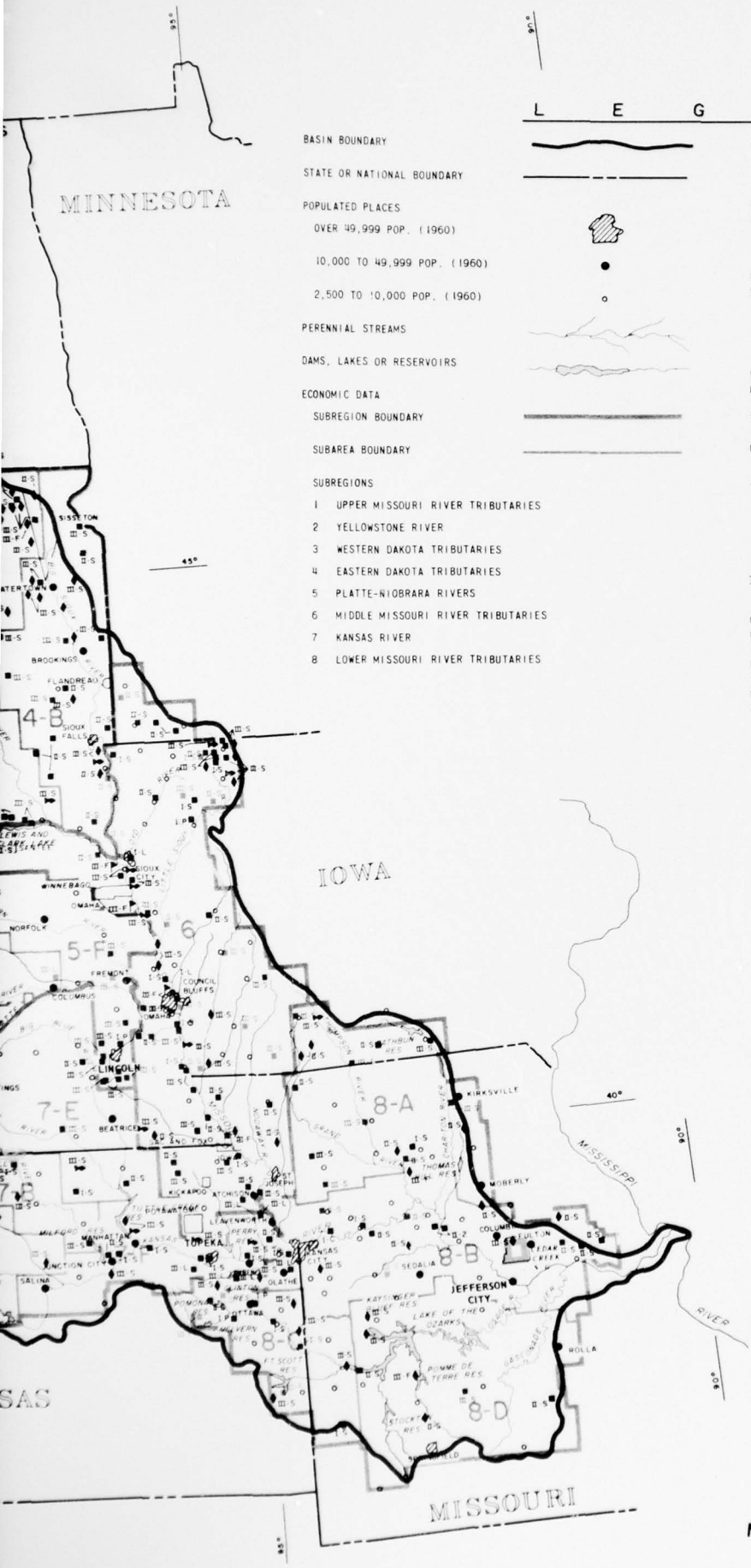

L E G E N D

BASIN BOUNDARY

STATE OR NATIONAL BOUNDARY

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10,000 TO 49,999 POP. (1960)

2,500 TO 10,000 POP. (1960)

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8 LOWER MISSOURI RIVER TRIBUTARIES

INDIAN RESERVATIONS AND SETTLEMENTS

NATIONAL GRASSLAND AND LAND UTILIZATIONS PROJECTS - (NG)

BUREAU OF LAND MANAGEMENT (PUBLIC DOMAIN) LANDS

DEVELOPED LAND ACREAGES
UP TO 20 AC. 21-100 AC. OVER 100 AC.

WILDLIFE AND GAME REFUGES, PUBLIC USE AND GAME MANAGEMENT AREAS

RECREATION AREAS AND ROADSIDE PARKS

FISHING AND HUNTING AREAS

ACCESS SITES

TYPE OF AREA	OWNERSHIP OR ADMINISTRATION	
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II - LAND-ORIENTED	S - STATE	T - TRIBAL
III - WATER-ORIENTED	L - LOCAL	C - COUNTY

NOTE: MANY AREAS NOT SHOWN INCLUDE SMALL LOCAL PARKS AND ALL CITY-BASED LOCAL PARKS, SMALL STATE PICNICKING AND CAMPING AREAS, SMALL HISTORIC AND ARCHEOLOGIC AREAS, MOST PRIVATE DEVELOPMENTS, MISCELLANEOUS FEDERAL LANDS, AND STATE FISHING, HUNTING AND WILDLIFE AREAS WITH LIMITED LAND AND WATER AVAILABLE FOR GENERAL RECREATION USE AND SOME STATE FORESTS. MORE SIGNIFICANT RECREATION AREAS ARE SHOWN ON THE MAP "MAJOR RECREATION AREAS".

N

SCALE 1:5,700,000

50 0 50 100 150 200

APPROXIMATE SCALE IN MILES

JUNE 1969

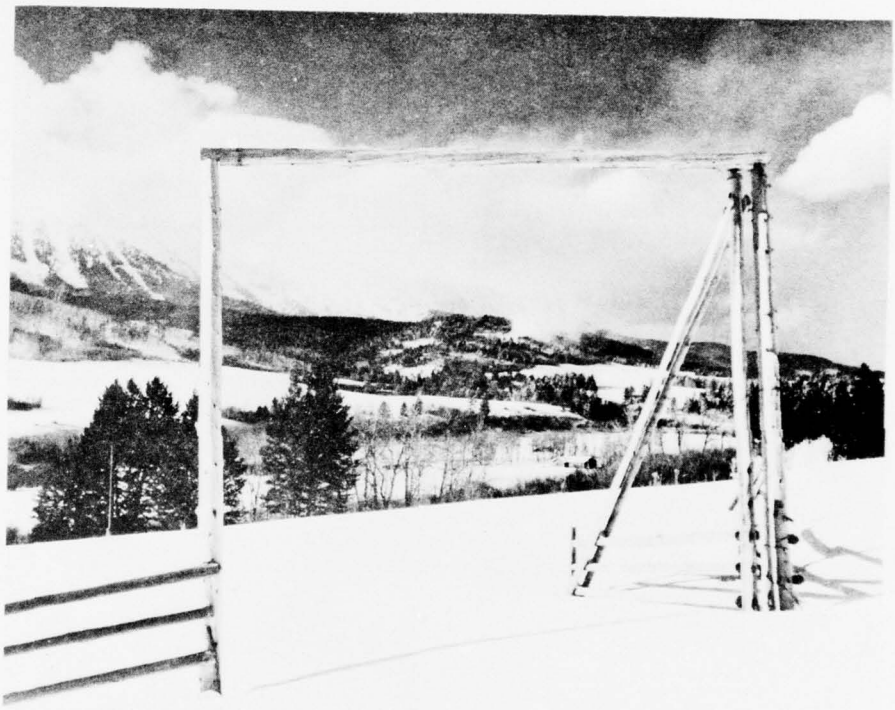
OTHER RECREATION AREAS

COMPREHENSIVE FRAMEWORK STUDY

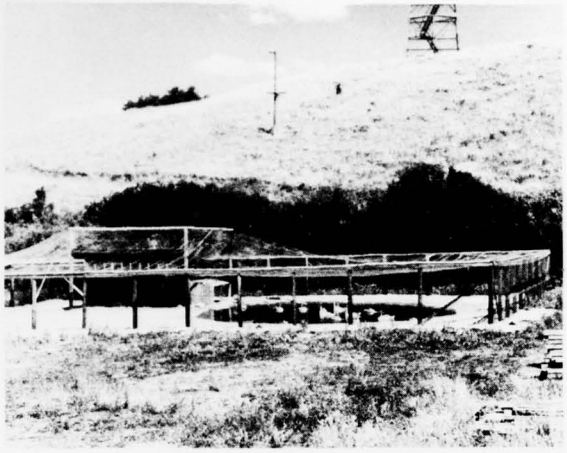
MISSOURI RIVER BASIN

MISSOURI BASIN INTER-AGENCY COMMITTEE

PLATE 2



Moisture Laden Clouds Provide Snow And Next Year's Runoff



Red Rock Lakes National Wildlife Refuge

Beaverhead National Forest

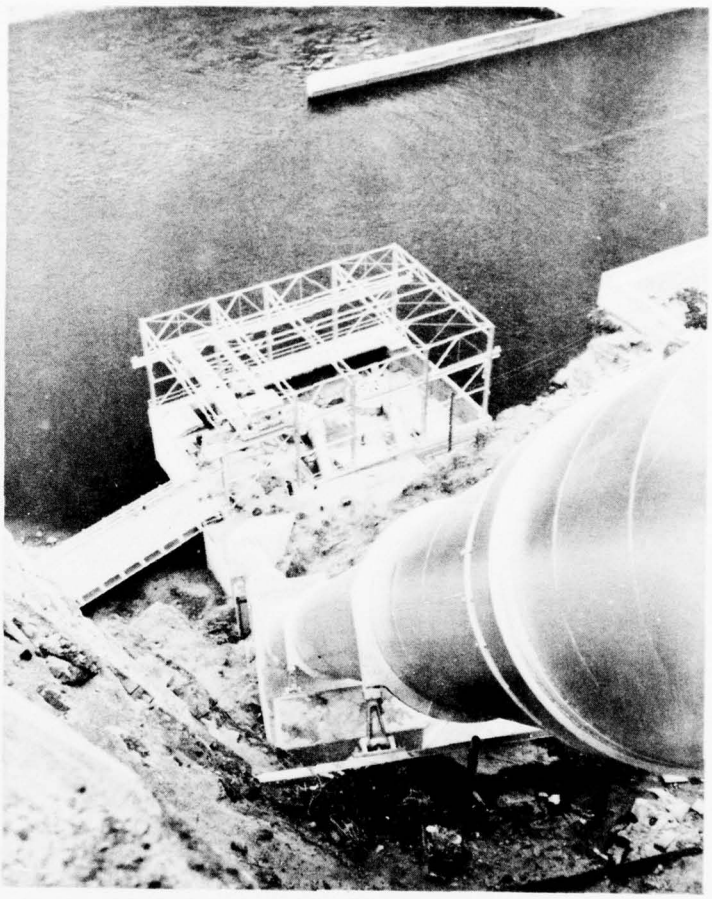
East Bench Unit

Ennis National Fish Hatchery

Gallatin National Forest

Table 1 – MISSOURI RIVER BASIN WATER AND RELATED LAND RESOURCES DEVELOPMENT ACTIVE PROGRAM

Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars							Schedule (FY)	
						Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Start	Projected Completion
UPPER MISSOURI SUBBASIN														
Red Rock Lakes NWR	Red Rock River	BSFW	Mont	F	Dikes, roads, recreational facilities	0.900	0.360					0.540	1935	1980
Lima Reservoir	Red Rock River	Water Users Irrig. Co.	Mont	I	125,000 acre-feet storage									1934
Sacajawea Historical Area	Lemhi Pass	FS	Mont	F-R WP	100 acre historical site in Beaverhead National Forest								1932	Continuing Program
Beaverhead National Forest	Madison River, Big Hole River, Red Rock River	FS	Mont	F-R-Fo-Gr	2,111,000 acres, 20 recreation areas, 2,900 acres water surface								1899	Continuing Program
Big Hole National Battlefield	Big Hole River	NPS	Mont	R	666 acres - Historic site - Visitor Center, roads, interpretive facilities	1.212				0.590 (thru FY-68)		0.622	1910	Continuing Program
Anaconda - Pintlar Wilderness Area	Big Hole River	FS	Mont	WP F-R	72,526 acres (portion of Beaverhead National Forest)									Continuing Program
West Bench	Ruby River	Mont	Mont	I	Canal 11.3 miles long supplying 3,000 acres of land	0.118	0.118						1943	1944
Vigilante Canal	Ruby River	Mont	Mont	I	21 miles of canals, serving 7,500 acres	0.372	0.372						1943	1954
Ruby River Reservoir	Ruby River	Mont WRB	Mont	I	Dam and reservoir with capacity of 38,850 acre-feet provides water for West Branch and Vigilante Canals	0.771	0.771						1937	1938
Deer Lodge National Forest	Boulder and Jefferson Rivers	FS	Mont	F-R Fo-Gr	735,000 acres - 24 recreation areas, 250 acres water surface								1906	Continuing Program
East Bench Unit, Three Forks Division	Beaverhead River	BR	Mont	I-F-FC-R	Clark Canyon Dam & Reservoir, a diversion dam and system of canals, laterals and drains will furnish water supply to 21,800 acres of new land. Lands receiving supplemental supply total 28,004 acres. Storage 257,152 acre-feet.	24.230	19.892	0.397	0.238	0.195	0.286	3.222	1960	1965
Cataract Storage	Cataract Creek	Mont	Mont	I	Dam and reservoir near Pony. Capacity 1,395 acre-feet for supplemental streamflow above Willow Creek Reservoir	0.234	0.234						1958	1963
Whitetail Reservoir	Whitetail Creek	Whitetail Irrig Dist	Mont	I	Storage 6,200 acre-feet									1922
Delmoe Lake	Pipestone Creek	Pipestone Water Users Assn	Mont	I	Storage 6,600 acre-feet									1923
Hebgen Dam & Reservoir	Madison River	Mont Power Co	Mont	P	200 kw - Hydro power installation - 384,800 acre-feet									1915
Madison River Canyon Earthquake Geologic Area	Madison River	FS	Mont	R-F WP	36,400 acres (Portion of Gallatin National Forest)								1959	Continuing Program
Madison Dam	Madison River	Mont Power Co	Mont	P	9,000 kw hydro power installation - 41,020 acre-feet storage.									1900
Norwegian Dam	Norwegian Creek	Norwegian Creek Group	Mont	I	Storage 1,460 acre-feet									1958
Ennis NFH	Madison River	BSFW	Mont	F	Complete redesign and enlargement of Fish Hatchery 500,000 pond capacity - 160 acres	5.300	0.300					5.000	1931	2000
Gallatin National Forest	Gallatin River	FS	Mont	F-R Fo-Gr	691,000 acres, 12 recreational areas, 16,000 acres water surface								1899	Continuing Program
Spanish Peaks Primitive Area	Gallatin River	FS	Mont	WP R-F	500,000 acres (portion of Gallatin National Forest)								1932	Continuing Program
Middle Creek	Hyalite Creek	Mont WRB	Mont	I	Reservoir with capacity of 8,027 acre-feet. 4.11 miles of canals; supplemental water for 16,000 acres of land	0.711	0.711						1939	1951



Helena Valley Unit

Bob Marshall Wilderness Area

Sun River Project

Table 1 (Continued)

Name Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars							Schedule (FY)	
						Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Start	Pro-jected Comple-tion
UPPER MISSOURI SUBBASIN (CONT'D)														
Bozeman NFH	Bridger Creek	BSFW	Mont	F	Addition and Renovation of existing hatchery	1.100	0.210					0.890	1893	1975
Crow Creek Pump Unit, Three Forks Division	Missouri River	BR	Mont	F-I	Pumping plant, canals laterals and drains to serve 5,031 acres of land, replacing lands inundated by Canyon Ferry Reservoir. Some drainage construction remains to be completed.	1.814	1.745	0.001	0.003	0.004	0.050	0.011	1953	1954
Broadwater Missouri Division	Missouri River	Mont	Mont	I	Concrete diversion dam across the Missouri near Toston, Mont. 48.2 miles of canal to irrigate 21,000 acres	1.189	1.189						1939	1940
Chessman Reservoir	Beaver Creek	City of Helena	Mont	M&I	1,733 acre-feet of storage									1908
Canyon Ferry Unit, Helena-Great Falls Division	Missouri River	BR	Mont	I-P-F-FC-M-R	Canyon Ferry Dam & Reservoir & Canyon Ferry Powerplant; capacity 50,000 kw. Outlet in dam serves pumps of Helena Valley Unit. Through storage and regulation, Unit is key to upstream and downstream irrigation development. Storage 2,050,900 acre-feet.	29.332	29.332						1948	1961
Helena Valley Unit, Helena-Great Falls Division	Missouri River	BR	Mont	I-M-F-R	Pumping plant at Canyon Ferry Dam, Main Canal, regulating reservoir and canals, laterals and drains, constructed to serve 14,147 acres of new land. City of Helena receives municipal water from project works. Some canal lining and drains remain to be constructed. Storage 10,568 acre-feet	15.140	13.764	0.194	0.150	0.189	0.176	0.667	1957	1961
Helena National Forest	Missouri River	FS	Mont	F-R Fo-Gr	736,000 acres, 12 recreation areas, 240 acres water surface								1900	Continuing Program
Hauser Dam and Reservoir	Missouri River	Mont Power Co	Mont	P	17,000 kw, Hydro power installation, 52,090 acre-feet									1911
Gates of the Mountain Wilderness Area	Missouri River	FS	Mont	WP F-R	28,600 acres (portion of Helena National Forest)								1932	Continuing Program
Holter Dam Reservoir	Missouri River	Mont Power Co	Mont	P	38,400 kw, Hydro power installation, 240,400 acre-feet									1918
North Fork Smith River Reservoir	North Fork Smith River	Mont WRB	Mont	I	Dam and storage reservoir, 11,600 acre-feet	0.310	0.310						1936	1936
South Side Canal	Smith River	Mont WRB	Mont	I	Canal 13.2 miles long for 2,000 acres	0.044	0.044						1936	1959
Florence Canal	Smith River	Mont	Mont	I	16.3 miles of canals using 8,000 acre-feet of Nelson Reservoir storage per year	0.173	0.173						1953	1961
Bob Marshall Wilderness Area	Sun River	FS	Mont	F-R WP	240,000 acres (portion of Lewis and Clark National Forest)								1929	Continuing Program
Lewis and Clark National Forest	Sun, Belt & Mussel-shell Rivers	FS	Mont	F-R Fo-Gr	1,858,000 acres, 25 recreation areas, 2,700 acres water surface								1899	Continuing Program
Nilan Reservoir	Smith and Ford Creek	Mont	Mont	I	Two dams to create offstream reservoir with capacity of 10,000 acre-feet and 10.7 miles of canal	0.411	0.411						1950	1951
Sun River Project	Sun River	BR	Mont	I-F-R FC	Gibson Dam & Reservoir diversion dams, offstream storage reservoirs (Pishkun and Willow Creek) and system of canals, laterals and drains serve 90,949 acres of land. Total storage 184,000 acre-feet.	10.641	10.641						1907	1927
Willow Creek Dam	Willow Creek	Mont WRB	Mont	I	Dam and reservoir with capacity of 18,000 acre-feet.	0.329	0.329						1936	1939
Vaughn	Sun River	CE	Mont	FC	12,570 foot levee and appurtenant works	0.458	0.015	0.024		0.355	0.064		1968	1969
Benton Lake NWR	Missouri River	BSFW	Mont	F	Riprap, recreation facilities, roads	2.000	1.100	0.210				0.690	1929	1975
Black Eagle Dam	Missouri River	Mont Power Co	Mont	P	16,800 kw - Hydro power installation									

Ryan Dam

Glacier National Park

Blackfeet Indian Irrigation Project

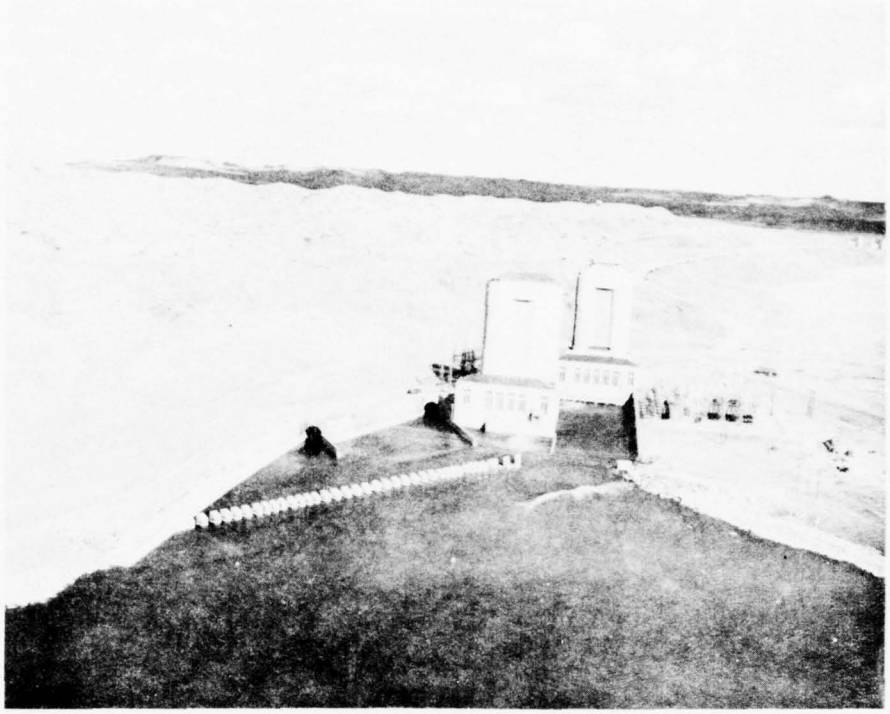
Lower Two Medicine Dam

Shelby

Charles M. Russell National Wildlife Refuge

Table 1 (Continued)

Name Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars							Schedule (FY)	
						Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Start	Projected Completion
UPPER MISSOURI SUBBASIN (CONT'D)														
Rainbow Dam	Missouri River	Mont Power Co	Mont	P	35,000 kw - Hydro power installation									
Ryan Dam	Missouri River	Mont Power Co	Mont	P	48,000 kw - Hydro power installation									
Morony Dam	Missouri River	Mont Power Co	Mont	P	45,000 kw - Hydro power installation, 13,260 acre-feet									1930
Cochrane Dam	Missouri River	Mont Power Co	Mont	P	48,000 kw - Hydro power installation									
Fort Benton	Missouri River	CE	Mont	FC	Dike and revetment - 5-ton filled - 1,360 feet pilot canal excavation 1,200 feet	0.130	0.130						1964	1964
Bynum Reservoir	*Runoff*	*Teton Co-op Reservoir Co*	*Mont*	*I*	*Storage 90,000 acre-feet*									1926
Glacier [9] National Park	Marias River, Milk River	NPS	Mont	R	Scenic, natural, scientific, glaciers lakes, Visitor centers, roads, trails, camping, picnicking and interpretive facilities. 1,013,100 acres.	93.405				68.574 (thru FY-68)	0.788	24.043	1910	Continuing Program
Blackfeet Indian Irrigation Project	Two Medicine Creek, Birch Creek	BIA	Mont	I-F-R	53,094 acres projected. 37,000 acres presently under ditch. Six diversion dams, 3 storage dams and reservoirs (Two medicine, Four Horns and Kipp Lake) 31,000 acre-feet. 522 miles of canals and laterals.	15.269	2.666	0.647	1.016	0.640	0.030	10.270	1907	1980
Swift Dam	Birch Creek	Pondera County Canal	Mont	I	Storage 31,000 acre-feet									1966
Lake Francis	Runoff	Valier Land & water	Mont	I	Storage 112,000 acre-feet									1927
Shelby	Marias River	SCS	Mont	FC-R WP	1 - FRS	0.354		0.246	0.028	0.051			1966	1969
Lower Marias Unit, Marias Division	Marias River	BR	Mont	I-F-FC-R M	Tiber Dam and Reservoir completed and serving recreation, flood control and fish and wildlife purposes. Construction of irrigation features 127,000 acres of land has been deferred. Storage 1,368,157 acre-feet.	39.050	21.322		0.175	2.051	2.499	13.003	1953	1956
Teton Co-op	Teton River	Mont	Mont	I	Dam and reservoir with capacity of 4,000 acre-feet	0.029	0.029						1938	1938
Theboe Lake	South Fork Willow Creek	Mont	Mont	I	Consists of dam and reservoir with capacity of 830 acre-feet for 500 acres of land	0.014	0.014						1937	1937
Farmers Co-op	Teton River	Farmers' Co-op Canal Co	Mont	I	Storage 4,500 acre-feet									1941
Eureka Reservoir	Teton River	Teton Co-op Canal Co	Mont	I	Storage 5,500 acre-feet									1917
Brady Lakes	Teton River & Muddy Creek	Brady Irrigation Co	Mont	I	Storage 1,300 acre-feet									1936
Ackley Lake	Off-stream (Judith River)	Ackley Lake Water Users Ass'n	Mont	I	Storage dam for 5,635 acre-feet and 28 miles of canal for approximately 6,000 acres of land	0.183	0.183						1937	1938
Lewistown Ditch	Spring Creek	Mont	Mont	I	Rehabilitation of diversion dam serving 1,500 acres	0.069	0.069						1937	1938
Charles M. [4] Russel, NWR	Missouri River	BSFW	Mont	F	Recreation facilities, roads, ponds	2,300	0.600					1.700	1936	1980



Fort Peck Dam And Reservoir

Rocky Boy's Recreation Complex

Table 1 (Continued)

Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars							Schedule (FY)	
						Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Start	Projected Completion
UPPER MISSOURI SUBBASIN (Cont'd)														
U. L. Bend NWR	Missouri River	BSFW	Mont	F	Meadow development, fences, dikes, roads, pumps and buildings	1.900				0.040	0.060	1.800	1967	1980
Upper Musselshell	Mussel-shell River	Mont	Mont	I	2 storage reservoirs and 3 diversion dams storing 30,139 acre-feet. 52 miles of canals; diversion 11,299 acre-feet	1.073	1.073						1938	1939
Lebo Lake	Am. Fork Lebo Creek	Ameri-can Fork Ranch	Mont	I	Storage 4,255 acre-feet									1965
Durand Dam	North Fork Mussel-shell River	Mont	Mont	I	Storage 7,009 acre-feet									1939
Martinsdale	Mussel-shell (off-stream)	Upper Mussel-shell Users Ass'n	Mont	I	Storage 23,105 acre-feet								1932	Contin-uing Program
Jawbone Creek	Mussel-shell River	SCS	Mont	FC-WP	2 - FRS, 1,400 acre-feet	0.083	0.010	0.066	0.007				1965	1968
Lake Mason NWR		BSFW	Mont	F	Fences, structure repair	0.070	0.010					0.060	1941	1980
Deadman's Basin	Mussel-shell River	Mont WRB	Mont	I	Reservoir capacity 70,000 acre-feet and 22 miles of canals	1.317	1.317						1934	1959
Delphia-Melstone Canals	Mussel-shell River	Mont	Mont	I	67 miles of canals serving 16,300 acres	1.060	1.060						1948	1955
Winnett Irri-gation Co.	Ford Creek	Mont	Mont	I	Lake and canal located 15 miles northeast of Winnett. Lake capacity 19,000 acre-feet. Water supply usually approxi-mately 4,500 acre-feet	0.196	0.196						1935	1938
Yellow Water	Yello-water River	Mont WRB	Mont	I	Storage reservoir with a capacity of 4,480 acre-feet	0.102	0.102						1935	1938
Petrolia Reservoir	Flat-willow Creek	Mont WRB	Mont	I	Dam and reservoir to store 9,192 acre-feet. 12.3 miles of canals and pump-ing plant to 3,300 acres	0.498	0.498						1950	1951
War Horse NWR	Box Elder Creek	BSFW	Mont	F	Fences, structure, rehabilitation	0.060	0.010					0.050	1958	1980
War Horse Reservoir	Off-Stream (Box Elder Creek)	Winett Irri-gation Co	Mont	I	Storage 19,250 acre-feet									1938
Fort Peck Dam and Reservoir	Missouri River	CE	Mont	FC-I-N-P-F-R	Reservoir capacity 19,400,000 acre-feet; installed power capacity 165,000 kw	157.516	156.752	0.091	0.017	0.145	0.105	0.406	1934	1965
Creedman Coulee NWR [4]	Milk River	BSFW	Mont	F	Ditching, structures, fences	0.120	0.020					0.100	1941	1980
Thibadeau NWR [4]	Milk River	BSFW	Mont	F	Fences, main structure replacement	0.450	0.050					0.400	1937	1985
Rocky Boy's Recreation Complex	Beaver Creek	Chip-pewa Tribe of Rocky Boy's Reservation	Mont	R	80 acre tourist comple-with restaurant, lodge, motel and pheasant farm. Hunting and fishing on reservation	0.337					0.002	0.335	1969	1970
Havre	Milk River	CE	Mont	FC	Two earthfill dams, channels, levees	1.826	1.826						1953	1957
Fort Belknap Irrigation Project	Milk River	BIA	Mont	I	13,320 acres. Milk River, Duck Creek, and Three Mile Units. One storage dam, 3 diversion dams, 1 pump plant, 28-mile main canal, 117 mile laterals. Project owns 1/7 of Fresno Dam. 10,474 acres under ditch.	1.611	0.861	0.043	0.007	0.007	0.007	0.686	1893	1980
Fort Belknap Irrigation Units (miscellaneous)	Tribu-taries of Milk River	BIA	Mont	I	1,703 acres in Ereaux, Big Warm, Peoples Creek and Brown Units	0.354	0.354						1893	1965

Milk River Project

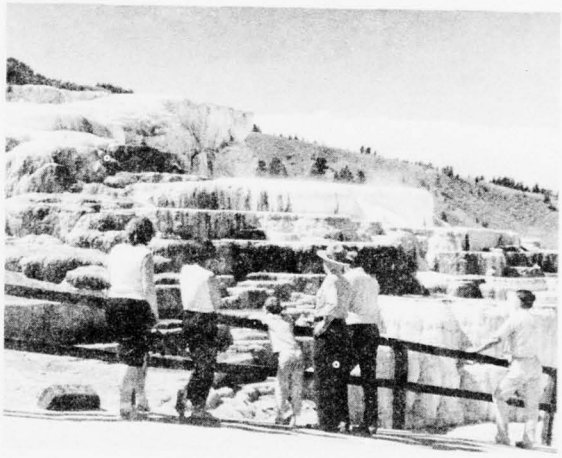
Fresno Dam And Reservoir

Box Elder Creek

Table 1 (Continued)

Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars							Schedule (FY)	
						Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Start	Projected Completion
UPPER MISSOURI SUBBASIN (CONT'D)														
Black Coulee NWR[4]	Milk River	BSFW	Mont	F	Ditching, riprap, fences, structure replacement	0.350	0.050					0.300	1938	1975
Bowdoin NWR	Milk River	BSFW	Mont	F	Diking, ditching, recreation facilities	0.600	0.341					0.259	1936	1975
Hewitt Lake NWR	Milk River	BSFW	Mont	F	Water management	0.060	0.005					0.255	1938	1980
Holshey	First Creek	Private	Mont	I-Rd	Storage 1,040 acre-feet									1956
Saco	Beaver Creek (Milk River)	CE	Mont	FC	Strengthening existing levees	0.068	0.068						1956	1957
Frenchman Reservoir	Frenchman Creek	Mont WRB	Mont	I	Dam and reservoir with capacity of 7,010 acre-feet, serving 7,000 acres.	0.491	0.491						1950	1953
Milk River[1] Project	Milk River	BR	Mont	I-M-FC-F-R	Sherburne Lake Dam and Reservoir on Swift Current Creek, Fresno Dam & Reservoir on Milk River and system of diversion dams, off-stream reservoir (Nelson), a pumping plant, canals, laterals, and drains provide facilities to serve 120,769 acres of land. Total storage 280,700 acre-feet. Project provides for diversion of 135,000 acre-feet of water annually from St. Mary's River to Missouri Basin, Milk River.	10.565	10.565						1907	1946
Collins Head-Cut Drop	Willow Creek	BLM	Mont	FC-Rd	Storage 1,335 acre-feet.									1957
Mud Pot Detention	Willow Creek	BLM	Mont	FC-Rd	Storage 3,100 acre-feet									1956
Glasgow	Milk River	CE	Mont	FC	Levees	0.017	0.017						1937	1938
Jim Detention	Lonetree Creek	BLM	Mont	F-FC-	Levees									1964
Triple Cross Detention	Lonetree Creek	BLM	Mont	F-FC	Storage, 4,787 acre-feet									1967
Grub Detention	Beaver Creek	BLM	Mont	F-FC-Rd	Storage, 3,963 acre-feet									1964
Gut Shot Detention	Lonetree Creek	BLM	Mont	F-FC Rd	Storage, 3,175 acre-feet									1965
Fort Peck Irrigation Project	Missouri River and Tribs.	BIA	Mont	I	23,230-acre project. 15,000 acres under ditch. One storage dam (Little Porcupine) 3,900 acre-feet. One diversion dam, 8 pumps, 20 miles main canal, 152 miles of laterals.	3.189	2.064	0.277	0.153	0.251	0.014	0.430	1908	1972
Nickwall	Missouri River	Mont	Mont	I	Storage 591 acre-feet for 600 acres	0.029	0.029							
Bainville FC Project	Shotgun Creek	Mont	Mont	FC-I	Dam and reservoir; capacity 2,300 acre-feet; also 3 canals	0.081	0.081						1937	1940
Carroll Reservoir	Plenty-wood Creek	Sheri-dan County	Mont	Rd	1,329 acre-feet storage									1930
Box Elder Creek	Big Muddy River	SCS	Mont	FC-R WP	1 FWR 4,763 acre-feet	0.328	0.321	0.003					1946	1967
Medicine Lake NWR	Muddy Creek	BSFW	Mont	F	Riprap, structure repair	0.500	0.200					0.300		1980
Big Muddy Reservoir	Big Muddy River	Roose-velt County & WRB	Mont	I	Storage 11,000 acre-feet									1930
Livestock Ponds		SCS FS BLM	Mont	Rd	22,000 ponds, 65,000 acres surface area									Conti-nuing Program

Teton National Forest



Yellowstone National Park

Lewis And Clark National Forest

Table 1 (Continued)

Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars: Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Schedule (FY): Start	Projected Completion
UPPER MISSOURI SUBBASIN (Cont'd)														
Public Domain Land Conservation Treatment	Missouri River & Tribs.	BLM	Mont	E-FC	95,000 acres - Contouring, pitting, furrowing, deep tillage, water spreading	0.689	0.630	0.019	0.040					

	Number Systems	Population Served	MGD
Water Supply			
Population Category			
Urban			
Over 100,000			
50-100,000	1	72,000	10.1
10-50,000	3	49,000	6.7
2.5-10,000	8	39,000	5.3
Rural Nonfarm			
to 2,500	83	55,000	6.0
Nonfarm (Individual systems)		51,000	1.8
Farm Domestic (Individual systems)		50,000	1.7

		Number Systems	Primary Treatment	Secondary Treatment	No Treatment
Sanitary [8] Treatment Plants 388 Communities	Mont	80	14	66	

	Type	Number of Areas	Acres
State, Local, and Private Recreation Areas	State	68	80,565
	Local	47	1,070
	Private	NA	30,672

Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars: Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Schedule (FY): Start	Projected Completion
YELLOWSTONE SUBBASIN														
Teton National Forest	Yellow-Stone River	FS	Wyo	F-R-Gr	65,000 acres								1905	Continuing Program
Teton Wilderness Area	Yellow-stone River	FS	Wyo	F-R	270,000 acres in the Shoshone National Forest								1932	Continuing Program
Yellowstone National Park	Yellow-stone River	NPS	Wyo Mont Idaho	R	Scenic-Scientific, Natural, Geysers, Hot Springs, Falls, Canyons, etc., Visitor Centers, Roads, Marinas, Camping, Picnicking, Trails, Interpretive facilities, etc 2,221,800 acres. (Note: Portions of park outside of basin, however, totals for entire park are shown.)	196,976				112,077 (thru FY-68)	6,843	78,056	1872	Continuing Program
North Absaroka Wilderness Area	Shoshone River	FS	Wyo	F-R	351,000 acres in Shoshone National Forest								1932	Continuing Program
Shoshone National Forest	Shoshone, Wood, Wind Rivers	FS	Wyo	F-R-I-G-FR	2,240,000 acres. 10,000 acres of recreation water; 5 classified major wilderness and primitive areas; university summer camps.								1891	Continuing Program
Absaroka Primitive Area	Yellow-stone River	FS	Mont	F-R	64,000 acres in Gallatin National Forest								1933	Continuing Program
Mystic Lake Reservoir	West Rosebud Creek	Mont Power Co	Mont	F	10,000 Ac - 20,800 acre-feet of storage									1925
Beartooth Primitive Area	Yellow-stone River	FS	Mont	F-R	175,000 acres								1933	Continuing Program
Red Lodge Rock Creek	Rock Creek	Mont	Mont	I	Two reservoirs and 8 miles of canals; capacity 31,715 acre-feet. Supplemental irrigation for 40,000 acres.	3,893	0.893						1935	1936
Glacier Lake	Rock Creek	Mont	Mont	I	Storage 1,900 acre-feet									1937
Lewis & Clark National Forest	Sweet-grass River	FS	Mont	F-FR-R-Gr	4,000 acres (also in Upper Missouri Subbasin)								1899	Continuing Program

Gallatin National Forest

Cooney Reservoir

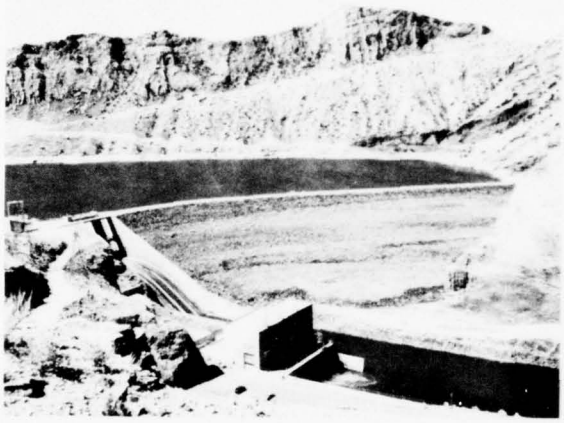
Corette Power Plant

South Absaroka Wilderness Area

Wind River Irrigation

Table 1 (Continued)

Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars: Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Schedule (FY): Start	Projected Completion
YELLOWSTONE SUBBASIN (Cont'd)														
Cottonwood Reservoir	Cottonwood Creek (Shields River)	Mont WRB	Mont	I	Dam and reservoir to store 1,400 acre-feet; 1,377 acres land are served.	0.127	0.127						1953	1953
Shields River	Shields River (Yellow-stone)	CE	Mont	FC	Channel improvement 2,880 feet; levees 2,250 feet	0.026	0.026						1950	1951
Gallatin National Forest	Yellow-stone River	FS	Mont	F-R-Gr-FR	1,010,000 acres - 4,600 acres water for recreation. (also in Upper Missouri Subbasin)								1899	Conti-nuing Program
Livingston Ditch	Yellow-stone River	Mont	Mont	I	Diversion canal to supply 3,080 acres of land. 10.2 miles of canals.	0.098	0.098						1936	1937
Huntley Project	Yellow-stone River	BR	Mont	I-M-F-R	Storage - 400 acre-feet. Diversion dam, relift pumping plant, offstream storage, and system of canals, laterals and drains serve 27,256 acres land.	2.726	2.726						1906	1937
Lake Walvoord	Sweet-grass Creek	Sweet-grass Canal and Reser-voir	Mont	I	Storage 9,710 acre-feet									1912
Lake Adam	Sweet-grass Creek	Sweet-grass Canal and Co	Mont	I	Storage 5,720 acre-feet									1912
Hailstone[4] NWR		BSFW	Mont	F	Control structure	0.050	0.005					0.045		1980
Halfbreed[5] Lake NWR		BSFW	Mont	F	Water facilities	0.060	0.010					0.050		1980
Columbus	Yellow-stone River	Mont	Mont	I	Diversion canal for 10,500 acre-feet from Yellowstone River	0.139	0.139						1938	1938
Cooney Reservoir	Red Lodge Creek	Mont WRB	Mont	I	Storage 24,195 acre-feet									1936
Stratified Primitive Area	Wind River	FS	Wyo	F-R	204,000 acres in Shoshone National Forest								1932	Conti-nuing Program
Frank Bird Power Plant	Yellow-stone River	Mont Power Co	Mont	P	Steam power plant 69,000 kw capacity									
Corette Power Plant	Yellow-stone River	Mont Power Co	Mont	P	Steam Power Plant 172,800 kw capacity									
Bridger National Forest	Sweet-water River	FS	Wyo	F-R-Gr-Fo	27,000 acres								1908	Conti-nuing Program
South Absaroka Wilderness Area	Shoshone River	FS	Wyo	F-R	506,000 acres in Shoshone National Forest								1932	Conti-nuing Program
Glacier Primitive Area	Wind River	FS	Wyo	F-R	177,000 acres in Shoshone National Forest								1937	Conti-nuing Program
Shoshone Lake	North Fork Popo Agie River	Wyo	Wyo	I	Irrigation storage reservoir constructed with funds borrowed from Wyoming Natural Resources Board. Storage capacity 9,740 acre-feet.	0.090								
Wind River Irrigation	Wind River	BIA	Wyo	I-F-R	56,890 acre project consisting of the Upper Wind, Johnstown, Left Hand, and Little Wind Units, and the LeClair-Riverton project. 38,855 acres under ditch. Nine diversion dams and 4 storage dams with 37,000 acre-feet capacity will supply water to project through 482 miles of canals and laterals.	9.598	3.141	0.067	0.056		0.008	6.326	1905	1980
Popo Agie Primitive Area	Wind River	FS	Wyo	F-R	70,000 acres in Shoshone National Forest								1937	Conti-nuing Program



Boysen Dam And Reservoir

Buffalo Bill Dam And Reservoir

Big Horn Canyon National Recreation Area

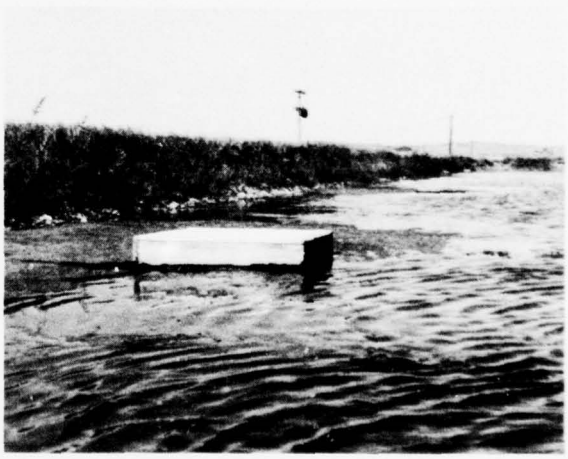
Crow Youth Camp

Table 1 (Continued)

Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars							Schedule (FY)	
						Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Start	Projected Completion
YELLOWSTONE SUBBASIN (Cont'd)														
Riverton Project	Wind River	BR	Wyo	I-F-P-R	Bull Lake Reservoir on Bull Lake Creek, tributary to Wind River, and diversion dam on Wind River with system of offstream storage, Pilot Butte Reservoir, canals, laterals and drains serve 54,459 acres. Power plant installed capacity is 1,600 kw. Total storage 189,000 acre-feet.	41.467	30.124	0.032	0.006			11.305	1920	1951
Boysen Unit Boysen Division	Wind River	BR	Wyo	I-P-FC-F-R M	Boysen Dam & Reservoir and Boysen Power plant. Power plant capacity is 15,000 kw. The storage and regulation Unit is key to upstream and downstream development. Storage 952,000 acre-feet.	33.815	33.815						1946	1953
Owl Creek Unit Bighorn Basin Division	S. Fork Owl Creek (Bighorn River)	Br	Wyo	I-FC-F-R	Anchor Dam & Reservoir and pumping from Bighorn River will provide supplemental water supply for 12,993 acres of land. Storage 17,354 acre-feet.	6.220	5.590	0.085	0.049	0.096	0.047	0.353	1956	1974
Hanover-Bluff Unit, Bighorn Basin Division	Bighorn River	BR	Wyo	I-F	Pumping plants from canals supplied by diversion from river serve 7,441 acres of land. Some drainage and minor construction underway.	5.025	4.367	0.120	0.055	0.167	0.132	0.184	1955	1972
Sunshine	Greybull River	Greybull Valley Irrigation District	Wyo	I	Irrigation reservor for supplemental irrigation of about 52,000 acres. Reservoir capacity nearly 53,000 acre-feet.	0.575								
Shell Reservoir	Shell Creek	Wyo	Wyo	I	Storage reservoir constructed with funds borrowed from Wyoming Natural Resources Board. Storage capacity 1,950 acre-feet to irrigate 2,700 acres of land.	0.084								
Shell Canal	Shell Creek	Shell Canal Co	Wyo	I	Rehabilitation 34 miles existing canal system.	0.128	0.128						1958	1959
Greybull	Bighorn River	CE	Wyo	FC	Levees 8,400 feet long	0.249	0.249						1958	1959
Shoshone Project	Shoshone River	BR	Wyo	I-P-FC-R-F M	Buffalo Bill Dam and Reservoir. Includes 6,012 kw Shoshone Power Plant and Heart Mountain Power Plant - 5,000 kw. System of canals diversion dams, offstream reservoirs, laterals, and drains serve 88,241 acres. Total storage 421,980 acre-feet.	24.472	23.576	0.019		0.003	0.038	0.836	1904	1948
Bighorn National Forest	Bighorn River Tongue River, Powder River	FS	Wyo	F-R-I-Gr-Fo	1,114,000 acres - 4,000 acres; recreation water - one major primitive area; 12 irrigation reservoirs.								1967	Continuing Program
Bighorn Canyon National Recreation Area	Bighorn River	NPS	Mont Wyo	R	Yellowtail Reservoir, recreation, scenic, natural, Visitor Center, roads, camping picnicking, trails, interpretive facilities, etc. 63,300 acres.	23.324				2.339 (thru FY-68)		20.985	1964	Continuing Program
Custer National Forest	Stillwater River, Rock Creek, Tongue River, Powder River	FS	Mont	F-R-G-FR	1,009,000 acres - 3,000 acres recreation water.								1905	Continuing Program
Crow Youth Camp	Black Canyon Creek	Crow Tribe	Mont	R	30-acre youth camp for Crow boys and girls. Recreation, conservation, and education are provided.	0.490	0.118	0.003	0.002	0.003	0.004	0.360	1963	1970

Crow Irrigation Project

Yellowtail Dam And Reservoir



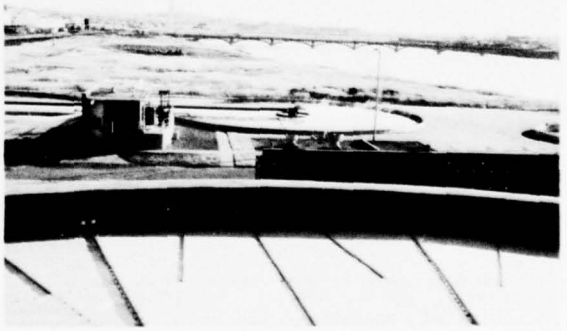
Miles City National Fish Hatchery

Table 1 (Continued)

Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars							Schedule (FY)	
						Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Start	Projected Completion
YELLOWSTONE SUBBASIN (Cont'd)														
Yellowtail Unit, Lower Bighorn Division	Bighorn River	BR	Mont Wyo	I-P-F-FC-R-M	Yellowtail Dam & Reservoir and Yellowtail Power Plant. Powerplant capacity is 250,000 kw. Provision is made in dam to serve future Hardin Unit, and reservoir will also serve units in Yellowstone Valley through storage and stabilization of flows. Total storage 1,378,150 acre-feet.	90.800	64.777	13.046	3.487	2.427	3.110	3.953	1961	1967
Crow Irrigation Project	Pryor Creek Bighorn River, Little Bighorn River	BIA	Mont	I-F-R	50,612-acre project. Nine diversion dams, and Willow Creek storage dam 23,000 acre-feet, supply water to various units of project through 103 miles of main canal and 315 miles of laterals and sublaterals and 17 miles of open drains. 40,000 acres presently under ditch.	5.402	3.333	0.075	0.330			1.664	1885	1980
Custer Battlefield National Monument		NPS	Mont	R	Historic - Site of battle between Custer and Indians, Visitor Center, roads, trails, interpretive facilities, etc. 765 acres.	0.998				0.988 (thru FY-68)			1886	Continuing Program
Custer Battlefield Recreation Complex	Little Bighorn River	Crow Tribe	Mont	R	60-acre commercial development for tourists visiting Custer Battlefield. Facilities will include a lodge, restaurant, motel, grandstand, and Heritage Park.	1.717					0.002	1.715	1969	1971
Bighorn - Tullock	Bighorn River	Mont	Mont	I	Diversion dam; capacity 4,860 acre-feet, 26.4 miles of canals. Serves 1,620 acres.	0.058	0.058						1940	1944
Hysham Pumping Project	Yellow-stone River	Mont	Mont	I	High and low lift pumping plants, 27.64 miles of canals and 12.36 miles of trans-mission lines. Serves 7,600 acres of land.	0.557	0.557						1948	1949
Forsyth	Yellow-stone River	CE	Mont	FC	Levees 13,000 feet long.	0.255	0.255						1947	1949
Kearney Lake	North Fork of South Piney Creek		Wyo	I	Reservoir for supplemental irrigation with capacity of 4,275 acre-feet.	0.300								
Willow Park Reservoir	South Piney Creek		Wyo	I-M	Reservoir for supplemental irrigation, stock and domestic purposes; capacity 4,130 acre-feet.	0.263								
Lake De Smet	Piney Creek		Wyo	I-M	Multiple-purpose reservoir - supplemental irrigation, stock and domestic purposes - proposed industrial and power purposes - capacity about 55,000 acre-feet.									
Cloud Peak Primitive Area	Bighorn River	FS	Wyo	F-R	137,000 acres in Bighorn National Forest								1932	Continuing Program
Clouds Peak Reservoir	South Fork of South Piney Creek		Wyo	I	Reservoir for supplemental irrigation; capacity 3,400 acre-feet.	0.122								
Sheridan	Goose & Little Goose Creeks (Tongue River)	CE	Wyo	FC	Channel improvement, levees and floodwalls	2.100	1.282						1961	
Tongue River Reservoir	Tongue River	Mont WRB	Mont	I	Dam and storage reservoir, 73,950 acre-feet capacity.	1.547	1.547						1937	1939
Northern Cheyenne Irrigation Project	Tongue River	BIA	Mont	I	5,755-acre project, 7,500 acre-feet storage in Tongue River Reservoir; 500 acres presently irrigated.	0.457	0.122	0.010	0.010	0.010	0.010	0.295	1907	2000
Hotchkiss	Tongue River	Mont	Mont	I	Diversion for 1,000 acre-feet and 5 miles of canals.	0.027	0.027						1940	1940
Miles City NFH	Tongue River	BSFW	Mont	F	Water supply lines, race-ways, roads	0.920	0.512					0.408		1980
North Fork Powder River	Powder River	SCS	Wyo	I	Irrigation storage reser-voir, 4,230 acre-feet.		0.201	0.031		0.017	0.037			1969

A Land Conservation Need on the Public Domain

Water Supply



Sanitary Treatment

Table 1 (Continued)

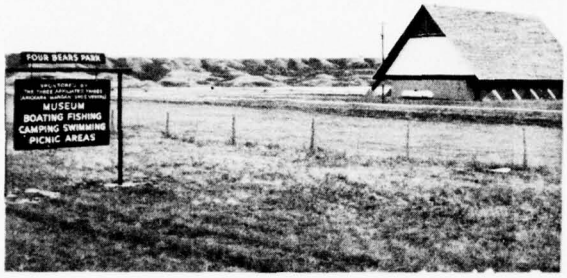
Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars: Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Schedule (FY): Start	Projected Completion
YELLOWSTONE SUBBASIN (Cont'd)														
Thunder Basin National Grasslands	Little Powder River	FS	Wyo	F-R-Gr	138,000 acres								1935	Continuing Program
Buffalo Rapids Project	Yellowstone River	BR	Mont	I-F	4 pumping plants on Yellowstone River, one relift plant, and system of canals, laterals, and drains serve 22,827 acres of land. Some drains remain to be constructed.	4.600	4.435	0.019	0.001	0.008	0.037	0.100	1937	1948
Intake Project	Yellowstone River	BR	Mont	I-F	Pumping plant on main canal of Lower Yellowstone Project and system of laterals serve 881 acres of land.	0.094	0.094						1946	1946
West Glendive	Yellowstone River	CE	Mont	FC	Levees and channel improvement	0.230	0.230						1959	1960
Savage Unit, Yellowstone Division	Yellowstone River	BR	Mont	I-F	Pumping plant on main canal of Lower Yellowstone Project and constructed canals and laterals serve 2,215 acres of land.	0.534	0.522					0.012	1949	1950
Lower Yellowstone Project	Yellowstone River	BR	Mont N Dak	I-M F	Diversion dam on Yellowstone River, relift pumping plant and system of canals, laterals and drains serve 52,221 acres.	4.617	4.596	0.021					1906	1909
Sidney Pumping	Yellowstone River	Sidney Water Users Ass'n	Mont	I	Three pumping plants, canals and power lines with substation. Serving 5,000 acres	1.073	1.073						1938	1939
Lewis & Clark Power Plant	Yellowstone River	Mont-Dak Utils Co	Mont	P	Steam power plant - 50,100 kw capacity									
Fort Union Trading Post, National Historic Site	Yellowstone - Missouri Rivers	NPS	Mont N Dak	R	Historic - Fur trading post restoration, Visitor facilities, etc. 380 acres.	0.631				0.017 (thru FY-68)	0.082	0.532	1966	Continuing Program
Acme Power Plant	Tongue River	Mont Dak Utilities	Wyo	P	Steam plant - 12,000 kw									
Livestock Ponds	-	SCS FS BLM	Wyo Mont	Rd	14,000 ponds with surface area of 34,000 acres									Continuing Program
Power Plants less than 10,000 kw	-	Private	Mont	P	Steam - 3 plants - 16,500 kw Hydro - 4 plants - 13,212 kw IC - 2 plants - 1,130 kw									
Public Domain Land Conservation Treatment	-	BLM	Mont Wyo	E-FC	Contouring, pitting, furrowing, deep tillage, water spreading. Mont - 33,000 acres Wyo - 101,000 acres	0.965	0.903	0.035	0.027					

	Number Systems	Population Served	MGD
Water Supply Population Category			M-Rd
Urban			
50-100,000	1	70,000	9.8
10-50,000	1	12,000	1.8
2.5-10,000	14	80,000	10.8
Rural Nonfarm			
to 2,500	49	31,000	3.5
Nonfarm (Individual systems)		53,000	1.9
Farm Domestic (Individual systems)		44,000	1.5

	Number Systems	Primary Treatment	Secondary Treatment	No Treatment
Sanitary [8] Treatment Plants 57 Communities (Wyo Mont)	57	18	38	1

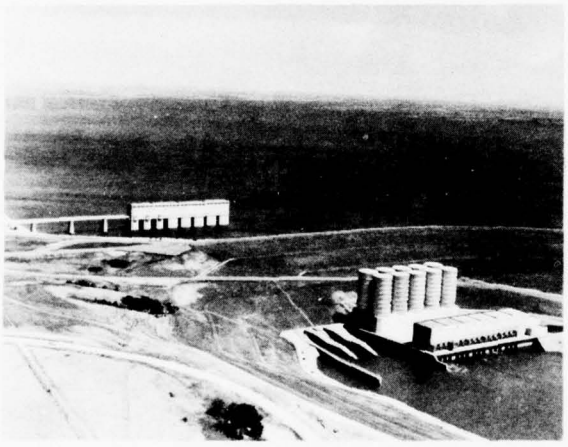
(Does not include institutions and industry that treat their own wastes)

Type	Number of Areas	Acres
State, Local, and Private Recreation Areas		
State	54	29,272
Local	51	1,467
Private	NA	135,600

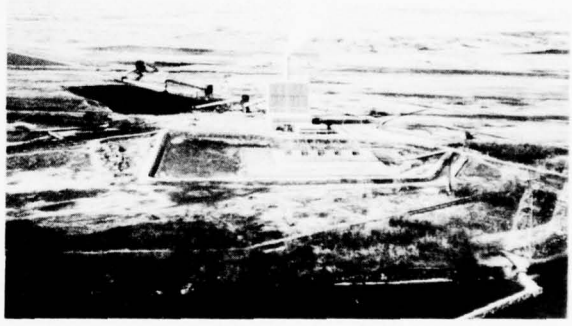


Four Bears Park

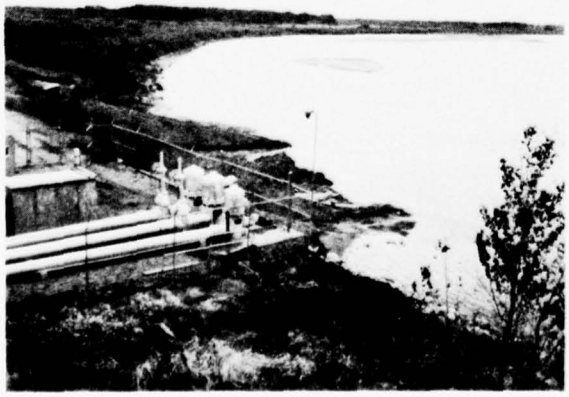
Theodore Roosevelt National Memorial Park



Garrison Dam And Lake Sakakawea



Leland Olds Power Plant

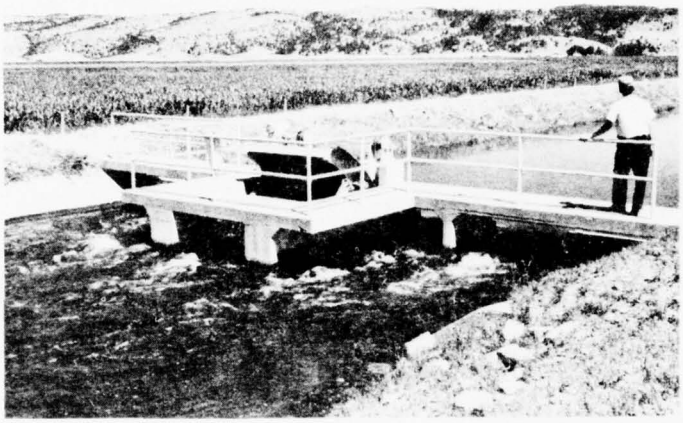


Fort Clark Unit

Mott

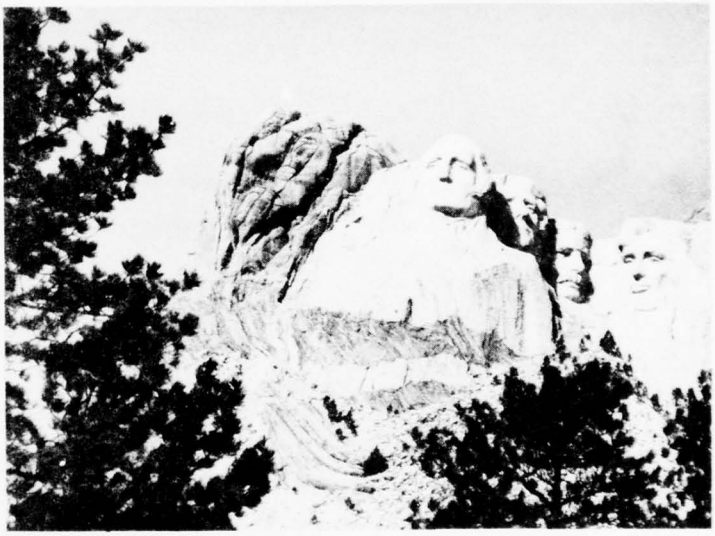
Table 1 (Continued)

Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars							Schedule (FY)	
						Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Start	Projected Completion
WESTERN DAKOTA SUBBASIN														
Four Bears Park	Missouri River	Three Affiliated Tribes of Fort Berthold Reservation	N Dak	F-R	136 acre park providing museum, picnic tables, shelters, fireplaces, and boat ramps	0.600	0.075	0.025				0.500	1961	1974
Marmarth	Little Missouri	CE	N Dak	FC	Raising and extending levees	0.169	0.169						1958	1959
Lamesteer NWR[5]	Beaver Creek	BSFW	Mont	F	Dam, fencing	0.015	0.010					0.005		1980
Little Missouri National Grasslands	Little Missouri River	FS	N Dak	F-Wp-Gr-R	1,027,000 acres								1935	Continuing Program
Theodore Roosevelt National Memorial Park	Little Missouri River	NPS	N Dak	R	Scenic, scientific, historic, badlands, visitor center, roads, trails, camping, picnicking. Interpretive facilities. 70,436 acres.	11.470				6.289 (thru FY-68)	0.218	4.963	1947	Continuing Program
Garrison Dam Lake Sakakawea	Missouri River	CE	N Dak	FC-I-N-P-F	Reservoir capacity 24,500,000 acre-feet; installed power capacity 400,000 kw	300.410	291.323	0.245	0.080	0.180	0.028	8.790	1946	1966
Leland Olds Powerplant	Missouri River	Basin Electric Power Co-op	N Dak	P	Steam plant - 240,000 kw									
Stanton Power Plant	Missouri River	United Power Assn	N Dak	P	Steam plant - 172,000 kw									
Lake Ilo[4] NWR	Knife River	BSFW	N Dak	F	Total Development Program	0.307	0.112					0.194		1967 or Later
Beulah Power Plant	Knife River	Mont-Dak Utilities	N Dak	P	Steam plant - 13,500 kw									
Fort Clark Unit, N Dak Pumping Division	Missouri River	Br	N Dak	I-F	Pumping plant serves 1,996 acres of new land	0.729	0.729						1952	1954
Dickinson Unit Heart Division	Heart River	BR	N Dak	I-M-FC-F-R	Dickinson Dam & Reservoir (Edward Arthur Patterson Lake) serves 400 acres of land and city of Dickinson Storage - 6,676 acre-feet	1.767	1.767						1949	1950
Heart Butte Unit, Heart Division	Heart River	BR	N Dak	I-FC-	Heart Butte Dam & Reservoir (Lake Tschida) serves pumping plants for 2,512 acres of irrigation. Storage 226,276 acre-feet.	6.784	4.558					2.226	1948	1956
Lower Heart	Heart River	CE	N Dak	FC	Levees and channel improvement	2.087	2.087						1958	1963
Mandan	Heart River	CE	N Dak	FC	Levees and appurtenant works	0.677	0.677						1949	1959
Heskett Power Plant	Missouri River	Mont-Dak Utilities	N Dak	P	Steam plant - 101,000 kw									
White Lake NWR	Cannonball River	BSFW	N Dak	F	Dike, spillway, fencing	0.009	0.009							
Mott	Cannonball River	SCS	N Dak	FP	1 - FRS	0.148				0.002	0.120	0.026	1967	1970
Pretty Rock[4] NWR	Cannonball River	BSFW	N Dak	F	Earthen dike and spillway	0.002	0.002							
Cedar River National Grasslands	Cedar and Cannonball Rivers	FS	N Dak	F-WP-Gr-R	7,000 acres								1935	Continuing Program
Standing Rock Irrigation Project	Missouri River	BIA	N Dak	I	700 acres being developed as individual tracts. Irrigation by sprinkler from river.	0.099			0.005	0.023	0.014	0.057	1967	1973
Long Soldier Coulee Recreation Area	Missouri River	Standing Rock Sioux Tribe	N Dak	F-R	400 acre area providing picnic facilities, campsites, rodeo arena, fishing	0.130	0.040	0.020	0.020			0.050	1963	1970
Stewart Lake[4] NWR	Cannonball River	BSFW	N Dak	F	Dike, spillway, fencing	0.010	0.010							
Scranton	Buffalo Creek	CE	N Dak	FC	One mile channel improvement and levees about one mile long	0.103	0.103						1959	1959



Angostura Unit

Mount Rushmore National Memorial



Black Hills National Forest

Table 1 (Continued)

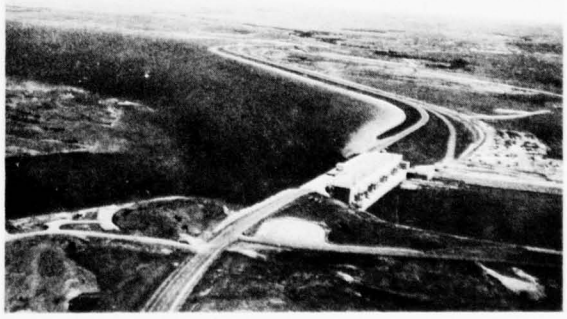
Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars: Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Schedule (FY): Start	Projected Completion
WESTERN DAKOTA SUBBASIN (Cont'd)														
Bowman-Haley Lake	North Fork Grand River	CE	N Dak	FC	Reservoir capacity 86,000 acre-feet	4.000	1.355	1.350	1.095	0.110	0.065	0.025	1964	1969
Custer National Forest	Little Missouri River	FS	Mont and S Dak	F-Wp-R-G-Fo	157,000 acres								1905	Continuing Program
Shadehill Unit, Grand Division	Grand River	BR q	S Dak	I-FC-F-R	Shadehill Dam & Reservoir constructed. Definite plans being prepared for irrigation of 6,700 acres of new land Storage - 357,382 acre-feet.	8.056	8.056						1949	1952
Grand River National Grasslands	Grand River	FS	S Dak	F-Wp-G	155,000 acres								1938	Continuing Program
Brueschke Park	Green Grass Creek (Moreau River)	Eagle Butte Community	S Dak	F-R	320-acre park, 9-hole golf course, 35-acre lake with boat docks, rodeo arena, picnic tables	0.110	0.056	0.001	0.001	0.001	0.001	0.050	1958	1972
Kirk Power Plant	Cheyenne River	Black Hills Power and Light	S Dak	P	Steam plant - 31,500 kw									
Thunder Basin National Grasslands	Little Missouri and Belle Fourche Rivers	FS	Wyo	F-Wp-Gr-R	573,000 acres								1935	Continuing
Osage Power Plant	Cheyenne River	Black Hills Power and Light	Wyo	P	Steam plant - 34,500 kw									
Jewel Cave National Monument	-	NPS	S Dak	R	Scientific - caverns, limestone formations, visitor center, roads interpretive facilities 1,275 acres	3.225				1.316 (thru FY-68)	1.488	0.421	1908	Continuing
Oglala National Grasslands	White River	FS	Nebr	F-Wp-Gr	94,000 acres								1935	Continuing Program
Buffalo Gap National Grasslands	Cheyenne and White Rivers	FS	S Dak	F-Wp-Gr	592,000 acres								1935	Continuing Program
Cottonwood Springs	Cottonwood Springs Creek	CE	S Dak	FC-R	Reservoir capacity 8,340 acre-feet	1.740	0.002	0.085	0.400	0.001	0.890	0.361	1968	1970
Cold Brook	Cold Brook (Fall Riv)	CE	S Dak	FC-R	Reservoir capacity 6,000 acre-feet	1.571	1.571						1950	1953
Hot Springs	Fall River	CE	S Dak	FC	Channel improvement 6,000 feet long	1.064	1.064						1947	1951
Angostura Unit Cheyenne Division	Cheyenne River	BR	S Dak	I-P-FC-F-R	Angostura Dam & Reservoir. Involves canals, laterals and drains to serve 12,218 acres of land. Storage 138,800 acre-feet.	15.394	15.394						1947	1953
Custer State Park	Cheyenne River	S Dak	S Dak	R										
Mount Rushmore National Memorial	-	NPS	S Dak	R	Sculptured heads in granite Washington, Jefferson, Lincoln, Roosevelt. Visitor center, roads, parking, interpretive facilities. 1,278 acres.	20.847				4.474 (thru FY-68)		16.373	1925	Continuing Program
Wind Cave National Park	-	NPS	S Dak	R	Scenic, natural limestone caverns, visitor center roads, camping, interpretive facilities - 28,059 acres.	6.005				4.133 (thru FY-68)		1.872	1903	Continuing Program
Black Hills National Forest	Cheyenne and Belle Fourche Rivers	'S	S Dak Wyo	F-R	1,220,000 acres - 1,790 acres of water for recreation and fishing 750 acres developed recreation areas								1897	Continuing Program
French Power Plant	Cheyenne River	Black Hills Power and Light	S Dak	P	Steam plant - 22,000 kw - Internal combustion plant - 10,000 kw									

Pactola Reservoir

Devils Tower National Monument

Spearfish National Fish Hatchery

Lower Brule Irrigation Project

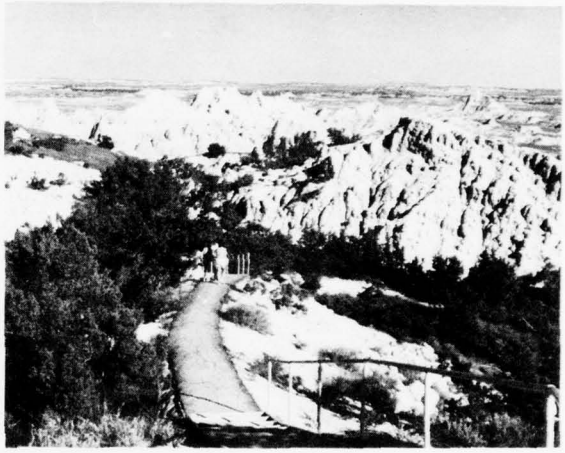


Big Bend Dam

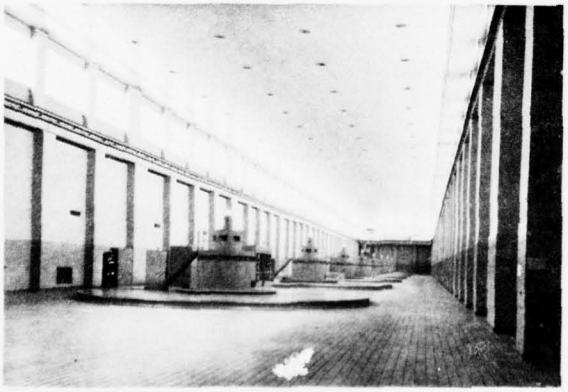
Table 1 (Continued)

Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars							Schedule (FY)	
						Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Start	Projected Completion
WESTERN DAKOTA SUBBASIN (Cont'd)														
Rapid Valley Project	Castle Creek and Rapid Creek (Cheyenne River)	BR	S Dak	I-M-F-R	Deerfield Dam & Reservoir operated jointly with Pactola Dam & Reservoir (Rapid Valley Unit, MRBP) furnishes municipal water and supplemental water for 8,900 acres of land along Rapid Creek. Storage 15,700 acre-feet.	0.920	0.920						1943	1947
Rapid Valley Unit, Cheyenne Division	Rapid Creek (Cheyenne River)	BR	S Dak	I-FC-M-F-R	Pactola Dam & Reservoir furnishes municipal water and some supplemental water for 8,900 acres of land along Rapid Creek. Storage 99,018 acre-feet.	7.986	7.986						1953	1957
Red Dale Gulch	Cedar Canyon (Rapid Creek)	CE	S Dak	FC	Earthfill dam	0.120	0.120						1960	1960
McNenny NFH	Red Water River (Belle Fourche)	BSFW	S Dak	F	Trout hatchery	0.533	0.262	0.025		0.020		0.226	1949	1972
Keyhole Unit, Cheyenne Division	Belle Fourche River	BR	Wyo	I-FC-F-R	Keyhole Dam and Reservoir - storage to provide supplemental water for 57,068 acres in Belle Fourche Project, S Dak. Storage 340,367 acre-feet.	4.723	4.723						1950	1953
Devils Tower National Monument	Belle Fourche River	NPS	Wyo	R	Scientific - columnar rock volcanic intrusion, visitor center, roads, trails, camping, picnicking, interpretive facilities, 1,347 acres	2.387				0.929 (Thru FY-68)		1.458	1906	Continuing Program
Spearfish NFH	Spearfish Creek	BSFW	S Dak	F	Trout hatchery	0.157	0.038					0.119	1898	1973
Spearfish No. 1	Spearfish Creek	Home Stake Mining Co.	S Dak	P	4,000 kw hydro-plant									
Spearfish No. 2	Spearfish Creek	Home Stake Mining Co.	S Dak	P	Industrial power plant - 4,000 kw hydro-plant									
Red Water No. 2	Red Water River	Black Hills Power and Light Co.	S Dak	P	346 kw hydro-plant									
Belle Fourche	Owl Creek (Belle Fourche River)	BR	S Dak	I-F-R	Diversion Dam Belle Fourche River and offstream storage provides for irrigation of 57,068 acres of land. Storage 192,000 acre-feet.	5.715	5.715						1905	1914
Belle Fourche	Belle Fourche River	CE	S Dak	FC	Levees	0.037	0.037						1938	1939
Bear Butte NWR	Belle Fourche River	BSFW	S Dak	F	Buildings and structures	0.043	0.043							
Oahe Dam Oahe Lake	Missouri River	CE	N Dak S Dak	FC-I-N-P-R	Reservoir capacity 23,600,000 acre-feet; installed power capacity 595,000 kw	343.500	322.033	6.020	5.910	1.200	1.350	6.987	1948	1970
Fort Pierre National Grasslands	Missouri River	FS	S Dak	F-Wp	116,000 acres								1935	Continuing Program
Lower Brule Irrigation Project	Missouri River	BIA	S Dak	I	1,000 acres in individual tracts. Irrigation by sprinkler from river	0.165			0.021	0.021	0.021	0.102	1967	1974
Big Bend Dam Lake Sharp	Missouri River	CE	S Dak	FC-N-P-R-F	Reservoir capacity 1,900,000 acre-feet; installed power capacity 468,000 kw.	105.750	91.204	4.830	2.300	1.146	0.900	4.620	1960	1969
Crawford NFH	White River	BSFW	Nebr	F	Trout hatchery	0.095	0.095						1928	
Oglala Irrigation Project	White Clay Creek	BIA	S Dak	F-I-R	1,256 acre project - 799 acres rehabilitation in gravity unit, 457 acre pump unit of new development, water supply from 7,200 acre-feet, Oglala Dam and Reservoir	0.252	0.084					0.168	1938	1972
White Clay Park	White Clay Creek	Oglala Sioux Tribe	S Dak	F-R	320 acre park, golf course, picnic tables, fireplaces, fishing	0.120	0.065	0.002	0.001	0.001	0.001	0.050	1960	1972

Ghost Hawk Park



Badlands National Monument



Fort Randall Power Plant

Livestock Ponds

Table 1 (Continued)

Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars: Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Schedule (FY): Start	Projected Completion
WESTERN DAKOTA SUBBASIN (Cont'd)														
LaCreek NWR	Little White River	BSFW	S Dak	F	Total development program	1.028	0.258					0.770		1976 or later
Ghost Hawk Park	Little White River	Rosebud Sioux Tribe	S Dak	F-R	18,820 acre park - picnicing, camping, rodeo arena, swimming, fishing, elk and buffalo pasture	0.270	0.060	0.002	0.002	0.003	0.003	0.200	1962	1972
Badlands National Monument	-	NPS	S Dak	R	Scenic, scientific, ruggedly eroded, animal fossils, visitor center, roads, camping, trails, interpretive facilities - 111,530 acres.	10.725				5.876 (Thru FY-68)		4.849	1939	Continuing Program
Rosebud Irrigation Project	White River	BIA	S Dak	I	700 acres in individual tracts. Irrigation by sprinkler from river	0.099			0.014	0.014	0.014	0.057	1967	1973
Fort Randall Dam Lake Francis Case	Missouri River	CE	S Dak	FC-N-P-R-F	Reservoir capacity 6,100,000 acre-feet; installed power capacity 320,000 kw	198.704	194.503	2.622	0.266	0.072	0.034	1.207	1946	1966
Livestock Ponds	-	SCS FS BLM		Rd	56,000 ponds - 96,000 acres of surface area									Continuing Program
Public Domain Land Conservation Treatment	-	BLM	Mont S Dak Wyo	E-FC	Contouring, pitting, furrowing, deep tillage, water spreading, Montana - 8,500 acres S Dak - 4,300 acres Wyoming - 7,800 acres	0.154	0.138	0.006	0.010					
Power Plants less than 10,000 kw	-	-	S Dak	P	10 Internal combustion power plants - 8,711 kw									

	Number Systems	Population Served	MGD
Water Supply Population Category			
Urban			
Over 100,000			
50-100,000			
10-50,000	2	71,000	9.9
2.5-10,000	11	51,000	7.1
Rural Nonfarm			
to 2,500	97	64,000	6.8
Nonfarm (Individual systems)		49,000	1.7
Farm Domestic (Individual systems)		79,000	2.6

		Number Systems	Primary Treatment	Secondary Treatment	No Treatment
Sanitary [8] Treatment Plants 449 Communities	Wyo. N Dak S Dak Mont	93	14	76	3

	Type	Number of Areas	Acres
State, Local, and Private Recreation Areas	State	126	40,989
	Local	231	4,615
	Private	NA	25,111

Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars: Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Schedule (FY): Start	Projected Completion
EASTERN DAKOTA SUBBASIN														
Buford-Trenton Project	Missouri River	BR	N Dak	I-F	Pumping plant serves 7,655 acres of new land	1.239	1.239						1940	1943
Lake Zahl NWR[4]	Little Muddy River	BSFW	N Dak	F	Dike, spillway and fencing	0.009	0.009							
Lostwood NWR	White Earth River	BSFW	N Dak	F	Total development program	0.211	0.108					0.103		1976 or later
Shell Lake NWR[4]	Shell Creek	BSFW	N Dak	F	Fencing	0.004	0.004							
Lake Nettie[4] NWR	Missouri River	BSFW	N Dak	F	Stock ponds, fencing	0.006	0.006							
Camp Lake NWR[4]		BSFW	N Dak	F	Dike	0.002	0.002							
Lost Lake NWR[4]	Missouri River	BSFW	N Dak	F	Dike and spillway	0.005	0.005							

Jamestown Dam And Reservoir

Audubon National Wildlife Refuge

Big Bend Dam – Lake Sharpe

Yankton Irrigation Project

Gavins Point Dam And Lewis And Clark Lake

Table 1 (Continued)

Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars							Schedule (FY)	
						Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Start	Projected Completion
EASTERN DAKOTA SUBBASIN (Cont'd)														
McLean NWR[4]	Douglas Creek	BSFW	N Dak	F	Dam, spillway, fencing	0.005	0.005							
Garrison[2] Diversion Unit, Garrison Division	James, Sheyenne, Red, and Souris Rivers	BR	N Dak	I-M F-R-FC-P	Construction for 250,000 acre initial phase. (59,300 acres in Missouri Basin) 664,000 acre-feet diversion out of Basin annually. Jamestown Dam and Reservoir completed 1954 - storage 220,978 acre-feet.	242.000		0.499	1.789	2.572	5.989	231.151	1967	1980
Audubon NWR[4]	Missouri River	BSFW	N Dak	F	Total development program	0.642	0.170					0.472		1976 or later
Garrison Dam Lake Sakakawea	Missouri River	CE	N Dak	FC-I N-P-F	Reservoir capacity 24,500,000 acre-feet; installed power capacity 400,000 kw	300.410	291.323	0.245	0.080	0.180	0.028	8.790	1946	1966
Garrison NFH[4]	Missouri River	BSFW	N Dak	F	Combination Hatchery	1.267	1.051					0.216	1958	1971
Canfield NWR[4]	-	BSFW	N Dak	F	Easement	Minor								
Florence Lake NWR	-	BSFW	N Dak	F	Fencing	0.010	0.010							
Chase Lake NWR	-	BSFW	N Dak	F	Total development program	Minor								
Slade NWR	Missouri River	BSFW	N Dak	F	Total development program	0.328	0.178					0.150		1976 or later
Lake George[4] NWR	Wintering Creek	BSFW	N Dak	F	Easement									
Hutchinson[4] Lake NWR	-	BSFW	N Dak	F	Easement									
Long Lake[4] NWR	-	BSFW	N Dak	F	Total development program	0.659	0.120					0.539		1976 or later
Appert Lake[4] NWR	-	BSFW	N Dak	F	Earthen Dike	0.002	0.002							
Sunburst NWR[4]	Missouri River	BSFW	N Dak	F										
Flickertail[4] NWR	-	BSFW	N Dak	F	Dike, spillway	0.009	0.009							
Springwater[4] NWR	-	BSFW	N Dak	F	Spillway culvert	0.001	0.001							
Herreid	Spring Creek	CE	S Dak	FC	Channel improvement and levees	0.050	0.050						1953	[illegible]4
Pocasse NWR[4]	Missouri River	BSFW	S Dak	F	Ponded water	Minor								
Hiddenwood[4] NWR		BSFW	N Dak	F	Easement									
Oahe Dam Oahe Lake	Missouri River	CE	N Dak S Dak	FC-I N-P-R	Reservoir capacity 23,600,000 acre-feet; installed power capacity 595,000 kw	343.500	322.033	6.020	5.910	1.200	1.350	6.987	1948	1970
Oahe Unit - James Division	James River	BR	S Dak	M-F-R	James Diversion Dam - Water supply 1,900 acre-feet to Huron. Dam a feature of proposed Oahe Unit.	0.603	0.541	0.042	0.014	0.002	0.005		1963	1965
Crow Creek Irrigation Project	Missouri River	BIA	S Dak	I	1,000 acres being developed in individual tracts - irrigation by sprinkler from river.	0.165			0.021	0.021	0.021	0.102	1967	1973
Big Bend Dam Lake Sharpe	Missouri River	CE	S Dak	FC-N P-R-F	Reservoir capacity 1,900,000 acre-feet; installed power capacity 468,000 kw	105.750	91.204	4.830	2.300	1.146	0.900	4.620	1960	1969
Randall RC and D	Missouri River	SCS FS	S Dak	FP-E-R-F-RD	Agricultural water development 9 units. Recreation and wildlife development 37 grade stabilization structures.								1965	
Fort Randall Dam, Lake Francis Case	Missouri River	CE	S Dak	FC-N P-R-F	Reservoir capacity 6,100,000 acre-feet; installed power capacity 320,000 kw	198.704	194.503	2.622	0.266	0.072	0.034	1.207	1946	1966
Lake Andes NWR	Missouri River	BSFW	S Dak	F-R	862 acres - water surface area 242 acres - 633 acre-feet	0.120	0.085			0.035				1968
Marne Creek	Marne Creek	SCS	S Dak		6.5 miles channel improvement 2 FRS - 2,804 acre-feet	0.256	0.040	0.008	0.005	0.006		0.197	1965	1975
Yankton Irrigation Project	Missouri River	BIA	S Dak	I	600 acres being developed by individual tracts. Irrigation by sprinkler from river.	0.099			0.013	0.013	0.013	0.060	1967	1974
Gavins Point Dam Lewis & Clark Lake	Missouri River	CE	S Dak Nebr	FC-N-P-R-F	Reservoir capacity 541,000 acre-feet; installed power capacity 100,000 kw	49.625	48.522	0.095	0.135	0.174	0.040	0.659	1952	1961

Gavins Point National Fish Hatchery

Pipestone National Monument

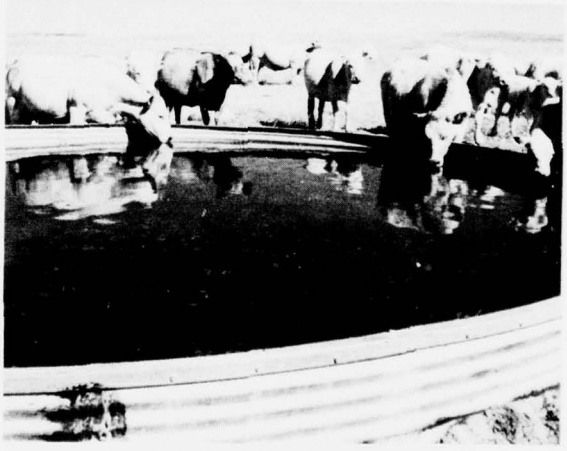
Pattie Creek

Sioux Falls

Table 1 (Continued)

Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars: Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Schedule (FY): Start	Projected Completion
EASTERN DAKOTA SUBBASIN (Cont'd)														
Gavins Point[4] NFH	Missouri River	BSFW	S Dak	F	Warm water hatchery	1.996	1.028	0.080				0.888	1957	1975
Arrowwood	James River	BSFW	N Dak	F	Total development program	1.242	0.212					1.030		1976 or later
Pipestem Lake	Pipestem Creek (James River)	CE	N Dak	FC-F-R	Storage 186,500 acre-feet	6.080					0.400	6.680	1969	
Halfway Lake[4] NWR	James River	BSFW	N Dak	F	Easement									
Northern Prairie Wildlife Research Center		BSFW	N Dak	F	Lab and other	2.365	0.798	0.376	0.056	0.150	0.150	0.935	1963	
Bone Hill Creek NWR[4]	James River	BSFW	N Dak	F	Dike, spillway	0.004	0.004							
Maple River[4] NWR	Maple Creek	BSFW	N Dak	F	Dike, spillway	0.035				0.035				
Dakota Lake[4] NWR	James River	BSFW	N Dak	F	Small Dam	0.001	0.001							
Sand Lake NWR	James River	BSFW	S Dak	F	Total development program	1.453	1.138					0.315		1967 or later
Aberdeen Power Plant	James River	Northwestern Public Service	S Dak	P	Steam plant - 12,500 kw									
Mitchell Power Plant	James River	Northwestern Public Service	S Dak	P	Steam plant - 15,000 kw									
Huron Power Plant	James River	Northwestern Public Service	S Dak	P	Internal combustion plant - 12,500 kw									
Waubay NWR	Big Sioux River	BSFW	S Dak	F	Total development program	1.283	0.051					1.232	1972	
Turkey Ridge Creek	Vermillion River	SCS	S Dak	FP-R	20 miles channel improvement 2 multiple-purpose structures, 4 FRS capacity 11,915 acre-feet	1.588	0.007	0.005	0.001		0.008	1.564	1965	1975
Upper Deer Creek	Big Sioux River	SCS	S Dak	FP	1 FWR - Channel improvement. Lake level control.	0.210		0.013		0.002	0.089	1.106	1962	1971
Pipestone National Monument		NPS	Minn	R	Historic quarry from which Indians obtained materials for making peace pipes. Visitor center.	0.457				0.411 (Thru FY-68)		0.046	1937	Continuing Program
Worthington Power Plant	Big Sioux River	Worthington Municipal	Minn	P	Steam plant - 16,500 kw									
Pattie Creek	Big Sioux River	SCS	S Dak	FP	8 FWR structures-recreation	0.672	0.241	0.118	0.010		0.115	0.188	1959	1972
Silver Creek	Big Sioux River	SCS	S Dak	FP	15.2 miles channel improvement, 6 FRS capacity 2,245 acre-feet	0.551	0.305	0.019	0.010	0.005		0.212	1958	1973
Sioux Falls	Big Sioux River	CE	S Dak	FC	20.7 miles levee, diversion structure, 5.2 miles diversion channel - spillway chute	5.929	5.929						1956	1965
Lawrence Power Plant	Big Sioux River	Northern States Power	S Dak	P	Steam plant - 48,000 kw									
Pathfinder Power Plant	Big Sioux River	Northern States Power	S Dak		Steam plant - 75,000 kw									
Sioux Falls Power Plant	Big Sioux River	Northern States Power	S Dak	P	Steam plant - 15,500 kw									
Green Creek	Big Sioux River	SCS	S Dak	FP-E	5 GSS	0.088	0.095						1963	1965
Richland	Big Sioux River	SCS	S Dak	FP	1 FWR - 905 acre-feet 3.5 mile channel improvement (inactive)	0.060	0.013					0.060	1960	1975
Brule Creek	Big Sioux River	SCS	S Dak	FP-E	80 miles channel improvement 17 FRS - 12,387 acre-feet	1.748	0.520	0.004	0.078	0.041	0.031	1.074	1963	1975

Ainsworth Unit



Farm Domestic (Individual Systems)

Table 1 (Continued)

Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars: Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Schedule (FY): Start	Projected Completion
EASTERN DAKOTA SUBBASIN (Cont'd)														
Scott Creek	Big Sioux River	SCS	S Dak	FP-E	2 FRS, 6 GSS, 3 drop spillways, 2,539 acre-feet 2.3 miles channel improvement	0.140	0.140						1954	1956
McCook Lake	Missouri River	CE	S Dak	R	Dredging lake	0.148	0.148						1956	1957
Kenslers Bend	Missouri River	CE	Nebr S Dak	C	Channel improvement	11.294	11.294						1946	1961
Livestock Ponds	-	SCS	-	RD	40,000 ponds - surface area 30,000 acres									Continuing Program
Power Plants - less than 10,000 kw	-	-	S Dak Iowa Minn	P	6 steam plants - 39,250 kw 42 internal combustion plants - 81,344 kw									

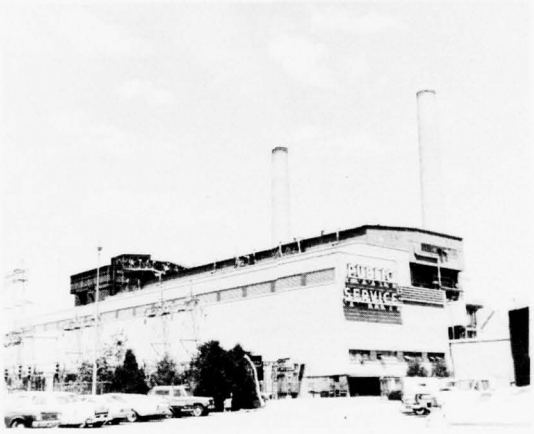
	Number Systems	Population Served	MGD
Water Supply			
Population Category			
Urban			
Over 100,000			
50-100,000	1	73,000	10.2
10-50,000	9	148,000	20.7
2.5-10,000	12	53,000	7.0
Rural Nonfarm			
to 2,500	247	144,000	15.8
Nonfarm (Individual systems)		75,000	2.6
Farm Domestic (Individual systems)		204,000	6.7

		Number Systems	Primary Treatment	Secondary Treatment	No Treatment
Sanitary[8] Treatment Plants 576 Communities	N Dak S Dak	221	33	168	20

Type	Number of Areas	Acres
State, Local, and Private Recreation Areas		
State	111	30,901
Local	577	10,653
Private	NA	28,597

Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars: Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Schedule (FY): Start	Projected Completion
PLATTE-NIOBRARA SUBBASIN														
Agate Fossil Beds National Monument	Niobrara River	NPS	Nebr	R	Scientific - miocene mammal fossils, visitor center, roads, trails, interpretive facilities - 2,995 acres	2.145				0.116 (Thru 1968)		2.029	1965	Continuing Program
Mirage Flats Project	Niobrara River	BR	Nebr	I-R-F	Box Butte Dam and Reservoir 31,060 acre-feet. Distribution System - 13.2 miles canal, 47.0 miles of laterals, water supply for 11,662 acres	3.062	3.062						1941	1946
Alliance Power Plant	-	Alliance Municipal	Nebr	P	Steam plant - 16,500 kw									
Antelope Creek	Niobrara River	SCS	Nebr	FP	3 FRS capacity 6,111 acre-feet	0.402	0.351						1958	1966
Ainsworth Unit Sandhills Division	Snake River	BR	Nebr	I-F-R	Merritt Dam and Reservoir 74,500 acre-feet. Distribution system - 53 miles canal, 170 miles of laterals. Water supply 33,960 acres.	26.150	21.941	2,472	0.586	0.227	0.229	0.695	1959	1966

Valentine National Wildlife Refuge

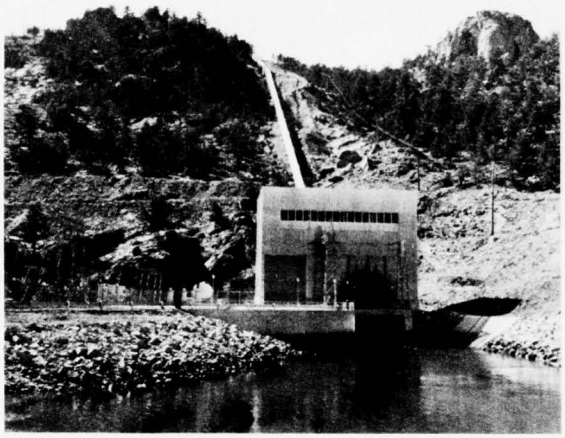


Arapahoe Power Plant

Cherry Creek Dam And Reservoir

Table 1 (Continued)

Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars							Schedule (FY)	
						Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Start	Projected Completion
PLATTE-NIOBRARA SUBBASIN (Cont'd)														
Valentine NWR	-	BSFW	Nebr	F-R	Total development program 71,516 acres - 6,000 acres water	0.811	0.361					0.450	1975	
Fort Niobrara NWR	Niobrara River	BSFW	Nebr	F-R	Total development 19,122 acres 50 acres water	1.750	0.210		0.005			1.535	1970	
Gavins Point Dam - Lewis & Clark Lake	Missouri River	CE	S Dak Nebr	FC-N-P-R-F	Reservoir capacity 541,000 acre-feet; installed power capacity 100,000 kw	49.625	48.522	0.095	0.135	0.174	0.040	0.659	1952	1961
Pike National Forest	South Platte River	FS	Colo	F-R Fo	1,005,000 acres - 790 acres water and 1,360 acres developed for recreation								1891	Continuing Program
Antero Park Reservoir	South Fork South Platte River	City of Denver	Colo	M	Owned and operated by Denver Water Board. Reservoir capacity - 22,290 acre-feet	0.300	0.300						1909	
San Isabel National Forest	South Platte River	FS	Colo	F Fo-Gr	6,000 acres								1891	Continuing
Eleven Mile Canyon Reservoir	South Platte River	City of Denver	Colo	I-M	Owned and operated by Denver Water Board. Reservoir capacity - 97,520 acre-feet.	1.200	1.200							1936
Cheesman Lake	South Platte River	City of Denver	Colo	M	Owned and operated by Denver Water Board. Reservoir capacity - 79,060 acre-feet.	1.400	1.400							1902
Chatfield Lake	South Platte River	CE	Colo	FC-F-R	Storage 235,000 acre-feet	82,700	0.019	0.415	5.185	6.800	9.000	61,281	1967	
Marston Lake	South Platte River and Bear Creek	Denver Water Board	Colo	M	An offstream reservoir used by the Denver Water Board for temporary storage of municipal water. Capacity - 16,500 acre-feet.	0.530	0.530							1890
Ft. St. Vrain Power Plant	South Platte River	Public Svc Co. of Colo.	Colo	P	Steam plant - 330,000 kw								1968	1972
Arapahoe Power Plant	-	Public Service Co	Colo	P	Steam plant - 250,500 kw									
Zuni Power Plant	-	Public Service Co	Colo	P	Steam plant - 115,250 kw									
Cherokee Power Plant	-	Public Service Co	Colo	P	Steam plant - 801,300 kw									
Valmont Power Plant	-	Public Service Co	Colo	P	Steam plant - 281,750 kw									
West Cherry	South Platte River	SCS	Colo	FP	10 FRS 6 GS - capacity 1,400 acre-feet	0.364	0.364						1958	1963
Franktown - Parker	South Platte River	SCS	Colo	FP	24 FRS - capacity 4,470 acre-feet	0.905	0.860	0.045					1961	1966
Cherry Creek Dam and Reservoir	Cherry Creek	CE	Colo	FC-R	Reservoir capacity - 95,000 acre-feet	15.181	14.788	0.020	0.055	0.080	0.083	0.155	1943	1961
Arapahoe National Forest	Clear Creek	FS	Colo	F-R-M Fo	181,000 acres; 300 acres water; 660 acres developed recreation sites; municipal water supply									Continuing Program
Cabin Creek Hydro Power	Cabin Creek (Trib. Clear Creek)	Colo Public Service Co	Colo	P	Pumpback hydroelectric power 1,400 acre-feet upper reservoir. 1,800 acre-feet lower reservoir. 300,000 kw	24.000							1964	1967
Aurora	Westerly Creek (Sand Creek)	CE	Colo	FC	Detention Dam, 380 acre-feet capacity	0.150	0.150						1953	1959
Ralston Reservoir	Ralston Creek (Trib to Clear Creek)	Denver Water Board	Colo	M	Stores transmountain diversions which come from Gross Reservoir down Boulder Creek thence to Ralston by a 9.6 mile conduit. Water used for Denver's winter municipal supply. Capacity - 11,270 acre-feet.	1.700	1.700							1938
Barr Lake	South Platte River	Colo	Colo	I	Offstream reservoir. Capacity 32,140 acre-feet									1889



Colorado Big Thompson Project
Pole Hill Power Plant

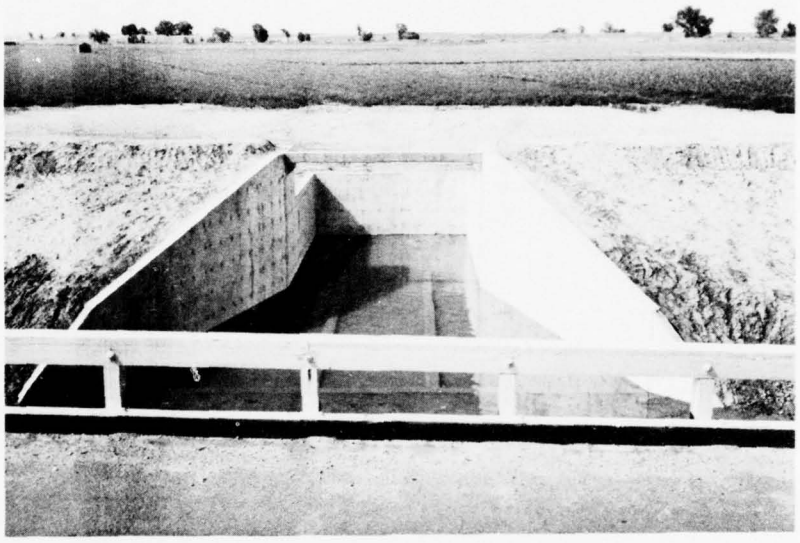
Rocky Mountain National Park

Home Supply

Roosevelt National Forest

Table 1 (Continued)

Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars							Schedule (FY)	
						Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Start	Projected Completion
PLATTE-NIOBRARA SUBBASIN (Cont'd)														
Gross Reservoir	South Boulder Creek	City of	Colo	M	Provide storage and regulation of Denver's transmountain diversions through Moffat Tunnel. Reservoir capacity - 43,060 acre-feet.	13.000	13.000							1954
Standley Lake	Woman Creek		Colo	I-M	Stores water from Coal and Woman Creeks. Supplies some municipal water to Westminister, Colorado. Reservoir capacity - 10,260 acre-feet.									1900
Horse Creek Reservoir	South Platte River	Henty-ten Irrigation System	Colo	I	An offstream reservoir. Capacity - 16,970 acre-feet									1911
Prospect	South Platte River		Colo	I	Storage - 5,610 acre-feet									1910
Reservoir No. 22	South Boulder Creek	City and County of Denver	Colo	M	Storage - 41,920 acre-feet									
Marshall Lake	South Boulder Creek		Colo	I	Offstream reservoir. Capacity 10,260 acre-feet									1885
Barkers Meadow Reservoir	Middle Boulder Creek	Colo Public Service Co	Colo	P	Reservoir capacity - 11,680 acre-feet - 20,000 kw									1910
Base Line	South Boulder Creek		Colo	I	Storage - 5,380 acre-feet									1907
Panoma Reservoir	Boulder Creek		Colo	I	Storage - 7,000 acre-feet									1904
Six Mile Reservoir	Boulder Creek		Colo	I	Offstream reservoir. 10,850 acre-feet									1953
Colorado Big Thompson Project [6] [7]	Colo Big Thompson - South Platte Rivers	BR	Colo	I-P-M-R-F	Transmountain diversion - Colo River - 10 reservoirs, 6 power plants, 183,950 kw, 3 pumping plants, 34 miles tunnels, supplemental irrigation. 994,360 acre-feet storage.	162.759	162.759						1938	1959
Rocky Mountain National Park [9]	South Platte River	NPS	Colo	R	Scenic, scientific, natural, lakes, rugged mountains, visitor centers, roads, trails, camping, picnicking, interpretive facilities - 262,324 acres.	64,049				34.420 (Thru 1968)	0.534	29.095	1915	Continuing Program
Boyd Lake	Big Thompson River		Colo	I	Originally constructed for power purpose. Converted to irrigation use in 1927. Offstream reservoir with 44,020 acre-feet capacity.									1904
Seven Lakes	Big Thompson River	Seven Lakes Reservoir	Colo	I	Storage - 3,440 acre-feet									1902
Home Supply	Big Thompson River	SCS	Colo	I	38 mile channel rehabilitation 1 storage resetvoir 5,000 acre-feet	0.981	0.025	0.179	0.362	0.112	0.130	0.173	1966	1971
Louden	South Platte River	SCS	Colo	FP-I	1 - multi-purpose structure capacity 5,000 acre-feet	0.267			0.074	0.113	0.063	0.019	1967	1971
Roosevelt National Forest	North & South Platte Rivers	FS	Colo	F-R	776,000 acres - 2,260 acres recreation water - 850 acres developed recreation sites								1905	Continuing Program
Lake Loveland	Big Thompson River		Colo	I-M	Offstream reservoir. Capacity 14,240 acre-feet									1893
Union Reservoir	St. Vrain Creek		Colo	I	Offstream reservoir. Capacity 12,740 acre-feet									1902
Milton Reservoir	South Platte River	Farmers Reservoir Irrigation Co	Colo	I	Offstream reservoir. Capacity 31,130 acre-feet									1909
Lower Latham	South Platte River		Colo	I	Storage - 5,760 acre-feet									1900

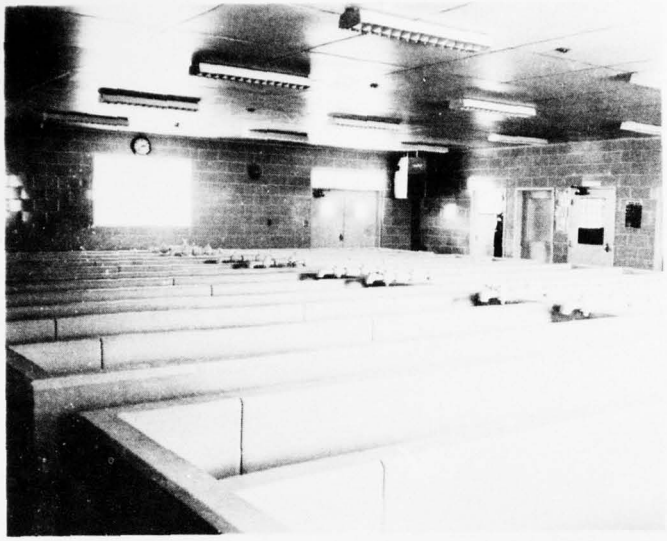


Coalbank Creek

Pawnee National Grasslands

Table 1 (Continued)

Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars: Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Schedule (FY): Start	Projected Completion
PLATTE-NIOBRARA SUBBASIN (Cont'd)														
Chamber Lake	Joe Wright & Trap Creeks (Fall River)	Water Supply and Storage Co.	Colo	I	Storage - 8,824 acre-feet									1891
Douglas	Cache La Poudre River		Colo	I	Storage - 6,000 acre-feet									1901
North Poudre # 15	Cache La Poudre River	North Poudre Irriga-tion Co	Colo	I	Storage - 5,500 acre-feet									1909
Terry Lake	Dry Creek (Cache La Poudre River)	Larimer and Weld Reser-voir Co	Colo	I	Storage - 9,700 acre-feet									1895
North Poudre # 6 Reservoir	Cache La Poudre River	Laramie Poudre Irriga-tion Co	Colo	I	Offstream reservoir. Capacity 10,260 acre-feet									1900
Timnath Lake	Cache La Poudre River		Colo	I	Storage - 10,000 acre-feet									1902
Fossil Creek Reservoir	Fossil Creek (Cache La Poudre River)		Colo	I	Reservoir capacity - 11,540 acre-feet									1901
Reservoir # 8	Cache La Poudre River	Divider Canal and Reser-voir Co	Colo	I	Offstream reservoir. Capacity 15,400 acre-feet								1903	
Cobb Lake	Cache La Poudre River	Laramie Poudre Irri-gation District	Colo	I	Storage - 9,120 acre-feet									1919
North Platte # 5	N.F. Cache La Poudre River		Colo	I	Storage - 5,750 acre-feet									
Park Creek Reservoir	No. Fork Cache La Poudre River	North Poudre Irri-gation Company	Colo	I	Offstream storage - 7,320 acre-feet	0.625					0.250	0.375	1968	1970
Halligan # 16	N.F. Cache La Poudre River	North Poudre Irriga-tion Co	Colo	I	Storage - 6,500 acre-feet									1906
Black Hollow	Cache La Poudre River		Colo	I	Storage - 8,000 acre-feet									1918
Windsor Reservoir	Cache La Poudre River	Windsor Canal and Reser-voir Co	Colo	I	Offstream reservoir. Capacity 15,620 acre-feet									1890
Coalbank Creek	South Platte River	SCS	Colo	FP	1 - FRS Capacity - 2,000 acre-feet; 2 drop inlets	0.237	0.237						1961	1963
City of Cheyenne	Douglas Creek	City of Chey-enne	Wyo	M	Expansion of Cheyenne's existing municipal water supply. Water comes from Douglas Creek, a tributary of North Platte. Replace-ment water comes from Little Snake River Drainage. Re-quires extensive system of pipelines and reservoirs.	11.000							1963	1966
Snyder Power Plant	-	Chey-enne Light, Fuel, and Power	Wyo.	P	Internal combustion plant - 10,000 kw									
Pawnee National Grasslands	South Platte River	FS	Colo	F-Gr	193,000 acres - submarginal grassland								1935	Conti-nuing Program



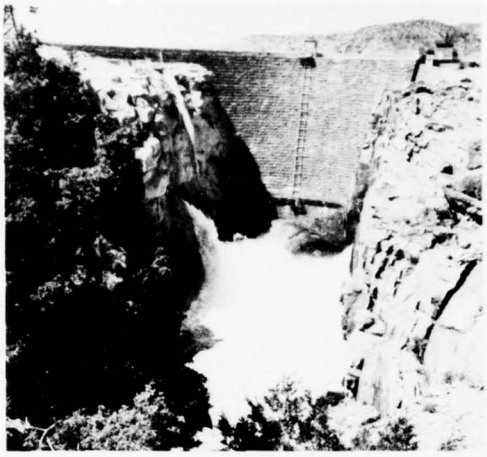
Saratoga National Fish Hatchery

Kortes Dam And Reservoir

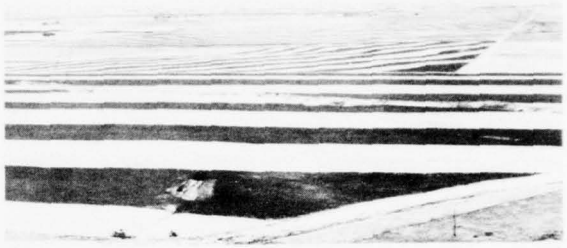
Seminoe Dam And Reservoir

Table 1 (Continued)

Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars: Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Schedule (FY): Start	Projected Completion
PLATTE-NIOBRARA SUBBASIN (Cont'd)														
Riverside Reservoir	South Platte River	Riverside Reservoir and Land Co	Colo	I	Offstream reservoir. Capacity 57,500 acre-feet	0.758	0.758							1908
Empire Reservoir	South Platte River	Bijou Irrigation Co	Colo	I	Offstream reservoir. Capacity 37,700 acre-feet	0.575	0.575							1909
Kiowa Creek	South Platte River	SCS	Colo	FP	8 Grade stabilizers, 60 FRS Capacity - 3,400 acre-feet	0.989	0.989						1958	1965
Jackson Lake Reservoir	South Platte River		Colo	I	Offstream reservoir. Capacity - 35,630									1903
Bijou # 2	Bijou Creek (South Platte River)		Colo	I	Storage - 6,000 acre-feet									1903
Prewitt Reservoir	South Platte River	North Sterling Irrigation Co	Colo	I	Offstream reservoir. Capacity - 32,900 acre-feet									1912
Point of Rocks Reservoir (North Sterling Reservoir)	South Platte River	North Sterl-Irrigation Co	Colo	I	Offstream reservoir. Capacity - 81,350 acre-feet									1908
Julesburg (Jumbo) Reservoir	South Platte River		Colo	I	Offstream reservoir. Capacity - 27,200									1905
Brule	South Platte River	SCS	Nebr	FP	1 FRS, 1,700 acre-feet, 2 miles Channel improvement	0.234		0.014	0.011	0.200		0.009	1968	1970
Cure	South Platte River	SCS	Nebr	FP	1 FRS - capacity 287 acre-feet	0.090	0.012	0.005	0.061	0.003			1965	1968
Mount Zirkel Wilderness Area	North Platte River	FS	Colo	F-R	54,400 acres								1932	Continuing Program
MacFarlane	Illinois & Willow Creeks	MacFarlane Irrigation Co	Colo	I	6,500 acre-feet									1910
Routt National Forest	North Platte River	FS	Colo	F-R-I Fo	344,000 acres - 1,717 acres recreation water - 250 acres developed recreation sites								1905	Continuing Program
Saratoga NFH	North Platte River	BSFW	Wyo	F	Fish production facilities and related buildings	0.855	0.250	0.241	0.145	0.007	0.100	0.112	1966	1969
Kortes Unit Oregon Trail Division	North Platte River	BR	Wyo	P	Kortes Dam and Reservoir 4,800 acre-feet and Kortes power plant 36,000 kw	14,615	14,611			0.004			1946	1950
Pathfinder NWR	North Platte River	BSFW	Wyo	F	Water control structures installed to provide for waterfowl									
Bridger National Forest	Sweetwater River	FS	Wyo	F-FO	15,000 acres								1908	Continuing Program
Bridger Wilderness Area	Sweetwater River	FS	Wyo	F-R	5,000 acres within Bridger National Forest								1932	Continuing Program
Shoshone National Forest	Sweetwater River	FS	Wyo	F-R	186,000 acres								1891	Continuing Program
Kendrick Project	North Platte River	BR	Wyo	I-P-F R-FC	Seminoe Dam & Reservoir 1,011,000 acre-feet; Seminoe power plant, 32,400 kw; and Alcova Dam and Reservoir, 189,000 acre-feet; Alcova power plant, 36,000 kw and distribution and drainage system. Irrigation for 24,265 acres.	34.302	32.236			0.050	0.595	1.421	1936	1955
Pacific Power and Light Co	North Platte River	Pacific Power and Light Co	Wyo	P	Steam - electric plant near Glenrock. 456,700 kw	25.000								1964



Pathfinder Dam And Reservoir



London Flats — Bovee

Gering Valley (C of E)

Gering Valley (SCS)

Scotts Bluff National Monument

Crescent Lake National Wildlife Refuge

Table 1 (Continued)

Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars							Schedule (FY)	
						Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Start	Projected Completion
PLATTE-NIOBRARA SUBBASIN (Cont'd)														
Glendo Unit Oregon Trail Division	North Platte River	BR	Wyo	I-P-FC-F-R	Glendo Dam and Reservoir - 795,200 acre-feet. Gray Reef Dam and Reservoir - 1,800 acre-feet. Glendo and Fremont Canyon power plant - 72,000 kw. Supplemental irrigation to 37,578 acres.	44.403	44.304	0.018	0.047	0.034			1955	1965
Rawah Wilderness Area	Laramie River	FS	Colo	F-R	27,000 acres in Roosevelt National Forest								1932	Continuing Program
Hutton Lake NWR	Sand Creek	BSFW	Wyo	F	Water control structures installed to provide for waterfowl		0.012	0.009	0.005					
Medicine Bow National Forest	North Platte River	FS	Wyo	F-R	1,069,000 acres - 1,550 acres of recreation water - 900 acres developed recreation areas - university summer camp								1900	Continuing Program
Lake Hattie	Laramie River		Wyo	I	Reservoir for irrigation purposes, with capacity of 68,500 acre-feet. Priority allows only infrequent diversion for storage.	0.080							1910	1913
Bamforth NWR	Laramie River	BSFW	Wyo	F	Water control structures installed to provide for waterfowl	0.001			0.001					
Fort Laramie National Historic Site	North Platte River	NPS	Wyo	R	Historic - fur trading and military post restoration, visitor and interpretive facilities - 563 acres	2.515				0.592 (Thru FY-68)	0.470	1.453	1938	Continuing Program
North Platte Project	North Platte River	BR	Wyo Nebr	I-P-F R-FC	Pathfinder, Guernsey, Lake Alice, Lake Minatare Dam & Reservoirs - 1,134,300 acre-feet. Guernsey power plant 4,800 kw - full water supply 226,237 acres; supplemental supply - 108,715 acres.	29.874	29.874						1905	1954
					Rehab - 100 miles canals, laterals, canal lining.	7.883	6.759	0.329	0.256	0.187	0.293	0.059		1970
Pine Ridge - Case Bier	North Platte River	SCS	Wyo	FP	2 FRS - capacity 3,560 acre-feet	0.270	0.270						1959	1960
London Flats Bovee	North Platte River	SCS	Wyo	FP	5.2 miles diversion channels and associated drops and outlet channels - 5 FRS	0.449	0.449						1962	1963
Arnold Drain	North Platte River	SCS	Wyo	FP-1	5 GSS. 1.1 mile channel improvement. 1 FRS - capacity 1,015 acre-feet'	0.114	0.112	0.001	0.001				1963	1964
Angell Draw	North Platte River	SCS	Wyo	FP	1 grade control structure 2.8 miles flood channel 1 FRS - capacity 820 acre-feet	0.336		0.026	0.013	0.019	0.260	0.018	1965	1970
Brown's Canyon	North Platte River	SCS	Nebr	FP-C	Detention storage and drop structures	0.200								
Gering Valley	Gering Drain	CE	Nebr	FC-E	24 drop structures, 17 rock sills. 4,800 foot rock-lined channel. 59 internal drainage structures. 13,000 foot channel improvements. 37,900 foot concrete trickle channels.	5.815	2.769	1.520	1.000	0.526			1963	1968
Gering Valley	North Platte River	SCS	Nebr	FP-E	9 miles diversion, 24 miles channel improvement, 9 FRS capacity 5,505 acre-feet	3.591	1.154	0.375	0.099	0.061	0.200	1.702	1962	1975
Scotts Bluff National Monument		NPS	Nebr	R	Historic - landmark on Oregon Trail, visitor center, roads, trails, interpretive facilities - 3,084 acres	1.060				0.650 (Thru FY-68)		0.410	1919	Continuing Program
Bluffs Power Plant		Consumer's PPD	Nebr	P	Steam plant - 42,200 kw									
Wildhorse	North Platte River	SCS	Nebr	FP	3 FRS - capacity 2,700 acre-feet	0.518	0.343	0.025	0.128	0.021			1957	1969
North Platte NWR	North Platte River	BSFW	Nebr	F	Lake Minatare									
Crescent Lake	North Platte River	BSFW	Nebr	F	Total development program	0.361	0.259					0.103	1964	1974
Sutherland Project	North & South Platte Rivers	Nebr Public Power Dist	Nebr	I-P	Reservoir - 181,460 acre-feet 26,100 kw									

Nebraska National Forest

Arcadia Diversion Dam

Pilger

Table 1 (Continued)

Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars: Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Schedule (FY): Start	Projected Completion
PLATTE-NIOBRARA SUBBASIN (Cont'd)														
Canaday Power Plant	North Platte River	Central Nebr Power & Irrig Dist	Nebr	P	Steam plant - 108,800 kw									
North Platte	Platte River	Nebr Public Power System	Nebr	P	26,100 kw - hydraulic plant									
Jeffrey Reservoir	Platte River	Central	Nebr	I-P	11,500 acre-feet - 18,000 kw								1941	
Spring Creek (Dawson)	Platte River	SCS	Nebr	FP	11 FWR, 34 miles channel improvement	1.412				0.008	0.010	1.394	1967	1975
Johnson Reservoir	Platte River	Central Nebr Public Power and Irrig Dist	Nebr	I-P	54,000 acre-feet; 2 plants 36,000 kw									
Kearney Power Plant	Platte River	Nebr Public Power System	Nebr	P	Hydro-plant - 1,500 kw on Kearney Canal									
Jones Creek	Platte River	SCS	Nebr	FP-E	1 FRS, 1 GS, 4 mile channel improvement - capacity 293 acre-feet	0.110	0.044	0.001	0.001	0.001	0.033	0.020	1964	1970
Burdick Power Plant	-	Grand Island Municipal	Nebr	P	Steam plant - 39,500 kw Internal combustion - 14,800 kw									
Pine Street Power Plant	-	Grand Island Municipal	Nebr	P	Steam plant - 17,500 kw									
Nebraska National Forest	Niobrara Loup Rivers	FS	Nebr	F-R-Fo	255,000 acres - 112 acres water - 200 acres developed recreation areas								1902	Continuing Program
Sargent Unit Middle Loup Division	Middle Loup River	BR	Nebr	I-FC-R	Milburn Diversion Dam and facilities to irrigate 12,755 acres	7.133	6.283		0.010	0.029	0.261	0.550	1955	1959
Farwell Unit Middle Loup Division	Middle Loup River-Oak Creek	BR	Nebr	I-FC-F-R	Sherman Dam and reservoir. 68,200 acre-feet irrigation for 47,925 acres - diversion Middle Loup River by Arcadia Diversion Dam. Sherman Feeder canal - 19.1 miles.	34.580	31.479	1.506	0.187	0.074	0.170	1.164	1960	1966
Columbus Hydro-Power	Loup River	Loup River Public Power Dist	Nebr	P	Hydro-plant - 39,900 kw									
Sheldon Power Plant		Consumer's PPD	Nebr	P	Steam plant - 228,650 kw									
Bellwood	Platte River	SCS	Nebr	FP	33 miles channel improvement 15 FRS - capacity 4,254 acre-feet	1.437	0.097	0.060	0.006	0.046	0.166	1.058	1964	1973
Schuyler	Platte River	CE	Nebr	C	Bank protection	0.075	0.075						1946	1947
Fremont # 1 Power Plant	-	Fremont Municipal	Nebr	P	Steam plant - 21,000 kw									
Fremont # 2 Power Plant	-	Fremont Municipal	Nebr	P	Steam plant - 43,750 kw									
Corporation Gulch	Elkhorn River	SCS	Nebr	FP-R	1 FRS.	0.467	0.297				0.004	0.463	1969	1971
Pierce	North Branch Elkhorn River	CE	Nebr	FC	2.6 miles levees	0.297	0.297						1963	1964
Norfolk	North Branch Elkhorn River	CE	Nebr	FC	7.2 miles levees. 4.2 miles diversion channel. Diversion structure - bridges, roads.	3.404	0.200	1.050	0.825	0.979	0.350		1966	1969
Madison	Elkhorn River	CE	Nebr	FC	Channel enlargement, appurtenant works	0.235	0.235						1965	1966
Pilger	Elkhorn River	SCS	Nebr	FP-E	3 mile channel improvement. 1 FRS - capacity 924 acre-feet.	0.188	0.011	0.072	0.081	0.003	0.010		1964	1969

Oak–Middle Creek

Upper Salt – Swedeberg

Public Land Domain – Conservation

Water Supply – Farm Domestic (Individual Systems)

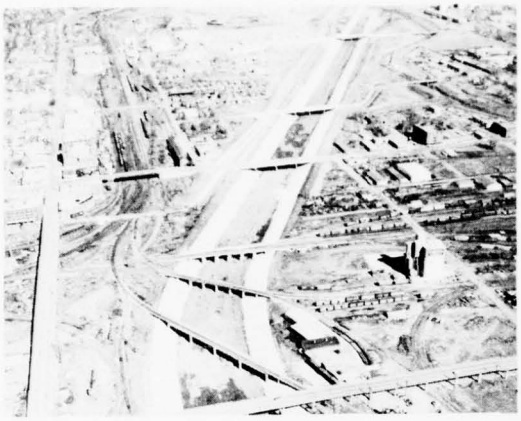
Table 1 (Continued)

Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars: Est Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Schedule (FY): Start	Projected Completion
PLATTE-NIOBRARA SUBBASIN (Cont'd)														
Wayne Power Plant		Wayne Municipal	Nebr	P	Internal combustion plant - 14,125 kw									
West Point	Elkhorn River	CE	Nebr	FC	2 miles levees	0.150	0.150						1963	1964
Clarkson	Middle Fork Maple Creek	CE	Nebr	FC	8,255 feet channel improvement 9,840 feet levees	0.192	0.192						1964	1965
Hooper	Elkhorn River	CE	Nebr	FC	2 miles levees	0.327	0.017	0.250	0.050				1966	1966
Waterloo	Elkhorn River	CE	Nebr	FC	21,680 feet levee	0.250	0.022	0.228					1966	1967
K Street Power Plant		Central Nebr Power and Irrig System	Nebr	P	Steam plant - 31,700 kw									
Oak-Middle Creek	Salt Creek	SCS	Nebr	FP-E	20 GS, 21 FRS - Capacity 7,142 acre-feet	0.967	0.641	0.015	0.118	0.154	0.020		1956	1970
Salt Creek (Active Portion)	Salt Creek	CE	Nebr	FC-R-F	10 dams, -8 miles levees and 6 miles channel improvement through Lincoln - 9.2 miles road relocation - alteration 5 railroad bridges	11.722	7.423	1.607	1.750	0.863	0.079		1962	1969
Wahoo Power Plant		Wahoo Municipal	Nebr	P	Internal combustion plant - 10,490 kw									
Upper Salt - Swedeberg (Pilot)	Salt Creek	SCS	Nebr	FP-E	62 GS, 34 FRS - capacity 16,094 acre-feet	1.818	1.500	0.117	0.016	0.154			1954	1970
Cottonwood	Platte River	SCS	Nebr	FP	10 FRS - capacity 5,696 acre-feet, 5 miles channel improvement	1.029		0.014	0.011	0.160		0.844	1966	1974
Turtle Creek	Platte River	SCS	Nebr	E	2 GSS	0.037	0.037						1960	1962
Livestock Ponds	-	SCS FS BLM	Colo Nebr Wyo		23,000 ponds - 25,000 acres									
Power Plants Less than 10,000 kw	-	Private	Colo Nebr Wyo	P	6 Steam plants - 40,775 kw 17 Hydro plants - 40,068 kw 37 Internal combustion plants - 90,476 kw									
Public Domain Land Conservation Treatment	-	BLM	Colo Wyo	E-FC	Contouring, pitting, furrowing deep tillage, water spreading Colo - 6,000 acres Wyo - 28,000 acres	0.257	0.208	0.035	0.014					

	Number Systems	Population Served	MGD
Water Supply			
Population Category			
Urban			
Over 100,000	2	1,000,000	170.0
50-100,000			
10-50,000	21	540,000	75.6
2.5-10,000	27	158,000	18.6
Rural Nonfarm			
to 2,500	290	198,000	21.8
Nonfarm (Individual systems)		146,000	5.1
Farm Domestic (Individual systems)		218,000	7.2

		Number Systems	Primary Treatment	Secondary Treatment	No Treatment
Sanitary [a] Treatment Plants 1,257 Communities	Wyo Colo Nebr	242	52	168	22

Type	Number of Areas	Acres
State, Local, and Private Recreation Areas		
State	79	109,888
Local	445	30,072
Private	NA	200,000



Floyd River

Wisdom Power Plant

Little Sioux River (SCS)

DeSoto National Wildlife Refuge

Mill – Picayune

Table 1 (Continued)

Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars							Schedule (FY)	
						Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Start	Projected Completion
MIDDLE MISSOURI SUBBASIN														
Aten	Missouri River	CE	Nebr	E	Emergency bank protection	0.579	0.579						1947	1951
Big Sioux Power Plant	Big Sioux River	Iowa Public Service	Iowa	P	Steam plant - 41,000 kw									
Kirk Power Plant	Missouri River	Iowa Public Service	Iowa	P	Steam plant - 17,500 kw									
South Hungerford	Floyd River	SCS	Iowa	FP-E	11 GSS	0.169	0.050			0.001	0.069	0.049	1964	1972
Floyd River Tributaries	Floyd River	SCS	Iowa	E	No structures	0.024	0.024						1954	1959
Gant Creek	Floyd River	SCS	Iowa	FP-S	22 GSS	0.501			0.079		0.156	0.266	1967	1975
Held	Floyd River	SCS	Iowa	FP-E	23 GSS	0.441	0.222		0.039				1963	1968
Floyd River	Floyd River	CE	Iowa	FC	Channel improvements, 5.6 miles. 9 miles Levees	11.559	11.559						1961	1966
Neal Power Plant	Missouri River	Iowa	Iowa	P	Steam plant - 147,050 kw									
Chief Big Elk Park	Missouri River	Omaha Tribe	Nebr	R-F	640-acre park, boat ramp, dock, picnic facilities, playground.	0.080	0.040					0.040	1962	1970
Blackbird Creek	Missouri River	CE	Nebr	FC	2.5 miles berm and levee, minor channel alignment	0.265	0.009		0.256				1967	1967
Lakes Okabena and Ocheda	Little Sioux River	SCS	Minn	FP-D F-M-R-WP	2 desilting basins; 1 FR and recreation structure; 1 F&WL improvement, 3,783 acre-feet	0.207		0.016	0.018	0.026	0.109	0.040	1965	1974
Spencer Power Plant	Little Sioux River	Spencer Iowa	Iowa	P	Steam plant - 12,500 kw Gas Turbine - 26,000 kw									
Wisdom Power Plant	Little Sioux River	Corn Belt Power Co-op	Iowa	P	Steam plant - 37,500 kw									
Little Sioux River	Little Sioux River	SCS	Iowa	FP-E	639 GSS; 314 miles channel improvement; 2,339 FRS	24.195		1.650	1.670				1946	
Little Sioux River	Little Sioux River	CE	Iowa	FC	138 miles levees, enlargement and straighten 34 miles channel main stem, 28 miles tributary channels	15.482	15.256	0.207		0.007		.012	1956	1966
Ida Grove	Maple River	CE	Iowa	FC	Straighten and enlarge channel and construct levees on Maple River and Odebolt Creek	0.419					0.419		1968	1969
Davis-Battle Creek	Soldier River	SCS	Iowa	E	20 GSS	0.481	0.210	0.145	0.015	0.070	0.058		1964	1968
DeSoto Bend NWR	Missouri River	BSFW	Iowa Nebr	F-R	Total development program	1.950	1.149	0.085	0.130			0.586	1971	1974
Big Park	Boyer River	SCS	Iowa	E	24 GSS, 2 FRS - 224 acre-feet	0.563	0.374	0.034	0.002	0.003	0.102	0.048	1960	1971
Mill-Picayune	Boyer River	SCS	Iowa	FP-E	153 GSS, 346 acres structural waterways; 0.57 miles diversion 9.24 miles levees and channels; 6 FRS - 3,333 acre-feet.	3.104	1.087	0.150	0.187	0.084	0.105	1.591	1961	1975
Harmony	Boyer River	SCS	Iowa	E	6 GSS	0.155	0.155						1957	1959
Ryan-Henschel	Missouri River	SCS	Iowa	FP-D-E	17 GSS; 35 acres structural waterways	0.481	0.195	0.060	0.087	0.026	0.048	0.065	1963	1971
Fort Calhoun Power Plant	Missouri River	Omaha Public Power Dist	Nebr	P	481,000 kw - Nuclear Plant									1973
North Omaha Power Plant	Missouri River	Omaha Public Power Dist	Nebr	P	Steam plant - 644,700 kw									
Council Bluffs Power Plant	Missouri River	Iowa Power and Light	Iowa	P	Steam plant - 130,600 kw									
Omaha	Missouri River	CE	Nebr	FC	12.3 miles levees; 5,707 feet floodwalls; 14 pumping plants	5.904	5.904						1947	1954
Council Bluffs	Missouri River	CE	Iowa	FC	14.4 miles levees; 4 pumping plants	2.558	2.558						1947	1954

Little Papillion Creek

Red Oak

Wilson Creek

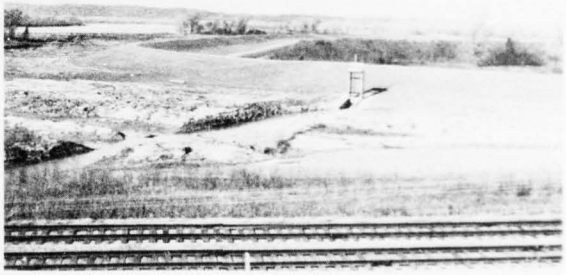
Table 1 (Continued)

Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars							Schedule (FY)	
						Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Start	Projected Completion
MIDDLE MISSOURI SUBBASIN (Cont'd)														
Jones Street Power Plant	Missouri River	Omaha Public Power Dist	Nebr	P	Steam plant - 173,500 kw									
Indian Creek	Missouri River	SCS	Iowa	E	15 GSS; 12.2 acres structural waterways	0.542	0.043	0.174	0.084	0.001	0.148	0.092	1965	1970
South Omaha Power Plant	Missouri River	Omaha Public Power Dist	Nebr	P	Steam plant - 20,000 kw									
Mosquito Creek (Harrison)	Missouri River	SCS	Iowa	E	57 GSS	1.118		0.003	0.006	0.049	0.080	0.980	1966	1974
Pony Creek	Missouri River	SCS	Iowa	FP-E	21 GSS; 4.3 miles channel improvement; 2 FRS - 3,206 acre-feet	1.038	0.528		0.142	0.029	0.304	0.035	1964	1972
Papillion Creek	Missouri River	SCS	Nebr	FP-E	52 GSS	1.512					0.320	1.480	1969	1978
Little Papillion Creek	Papillion Creek	CE	Nebr	FC	Channel improvements. Tieback levees	3.820	0.210	1.014	0.770	1.116	0.294	0.416	1965	1969
Lower Papillion Creek	Papillion Creek	CE	Nebr	FC	Channel cleanout and cutoff channel	0.117	0.117						1964	1965
Kramer Power Plant	Missouri River	Nebr Public Power System	Nebr	P	Steam plant - 112,500 kw									
Plattsmouth	Missouri River	SCS	Nebr	FP-E	1 GSS; 10 FRS - 502 acre-feet (suspended)	0.219	0.161						1958	1966
Nebraska City Power Plant	Missouri River	Nebr City, Nebr	Nebr	P	Internal combustion power plant - 13,200 kw									
Cee Jay	Nisnabotna River	SCS	Iowa	D-E	17 GSS; 4.8 acres structural waterways	0.285	0.148	0.070	0.017		0.021	0.029	1964	1969
Atlantic Power Plant	Nisnabotna River	Atlantic, Iowa	Iowa	P	Steam plant - 10,000 kw									
Mule Creek	Nishnabotna River	SCS	Iowa	FP-E	24 GSS	0.489	0.489						1954	1958
Simpson	Nishnabotna River	SCS	Iowa	FP-E	5 GSS	0.140	0.140						1959	1961
Hound Dog	Nishnabotna River	SCS	Iowa	FP-E	11 GSS; 7.5 miles diversion; 5.6 acres structural waterways; 6 FRS - 179 acre-feet	0.239	0.239							1966
Davids Creek	Nishnabotna River	SCS	Iowa	E	58 GSS; 62 acres structural waterway	0.870	0.132	0.135	0.006	0.023	0.077	0.497	1963	1974
Crooked Creek	Troublesome Creek	SCS	Iowa	FP-E	23 GSS; 5 FRS - 2,360 acre-feet	0.440	0.312	0.016	0.007	0.001		0.104	1961	1972
Red Oak	Nishnabotna River	CE	Iowa	FC	10,000 feet levees	0.400	0.400						1962	1963
Pierce Creek # 1	Nishnabotna River	SCS	Iowa	FP-E	8 GSS	0.197	0.039	0.001	0.020		0.119	0.018	1964	1969
Hamburg	Nishnabotna River	SCS	Iowa	FC-E	4 GSS; 2 FRS - 341 acre-feet	0.170	0.170						1961	1963
Nishnabotna River - Hamburg Iowa	Nishnabotna River	CE	Iowa	FC	10,000 feet levees	0.236	0.236						1947	1948
Turkey Creek	Nishnabotna River	SCS	Iowa	FP-E	103 GSS; 10 FWR; 13.4 mile channel improvement. 7,883 acre-feet storage	2.632		0.009	0.123	0.010	0.057	2.433	1966	1974
Cooper Nuclear Power Plant	Missouri River	Nebr Public Power System	Nebr	P	Nuclear power plant 800,000 kw									
Wilson Creek	Nemaha River	SCS	Nebr	FP-E	17 GSS; 22 FRS - 12,072 acre-feet	2.537	0.821	0.099	0.150	0.123	0.158	1.186	1960	1972
Falls City Power Plant	Big Nemaha River	Falls City, Nebr	Nebr	P	Internal combustion power plant - 10,016 kw									
Brownell (Pilot)	Nemaha River	SCS	Nebr	FP-E	35 GSS; 5 combination GS & FWRS; 4 FRS - 1,797 acre-feet	0.672	0.672						1954	1962

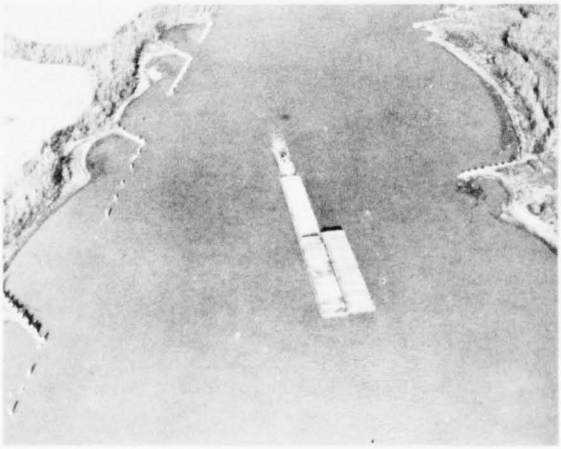
Walnut Creek

White Clay – Whiskey Creek

102 River Tributaries



Agricultural Levees



Bank Stabilization – Navigation Project

Rural Water Supply

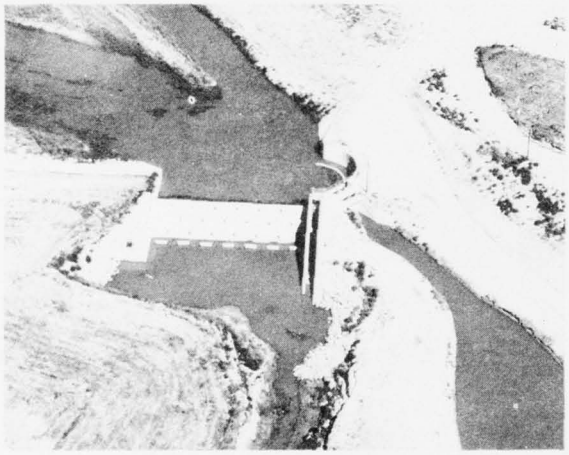
Table 1 (Continued)

Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars							Schedule (F	
						Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Start	Project Completion
MIDDLE MISSOURI SUBBASIN (Cont'd)														
Upper Big Nemaha	Nemaha River	SCS	Nebr	FP-E	10 GSS; 35 FRS - 23,830 acre-feet	3.416		0.042	0.108	0.084	0.210	2.972	1962	1973
Rock Creek	Turkey Creek	SCS	Nebr	FP-E	12 GSS; 5 FRS - 1,663 acre-feet	0.361		0.047	0.045	0.026	0.060	0.193	1965	1972
Spring Creek (Johnson)	Nemaha River	SCS	Nebr	FP-E	6 GSS; 7 FRS - 3,944 acre-feet	0.829			0.079	0.060	0.150	0.540	1963	1971
Ziegler	Nemaha River	SCS	Nebr	E	Grade Stabilization structure	0.350		0.043	0.130	0.049	0.101	0.027	1964	1970
Walnut Creek	Nemaha River	SCS	Kans	FP-E	30 GSS; 21 FRS - 11,142 acre-feet	2.160	1.619	0.247	0.108	1.153	0.028	0.005	1960	1970
Walters Creek	Nodaway River	SCS	Iowa	FP-E	37 GSS; 3 FWR; 1 recreation development - 14,830 acre-feet	1.096	0.001	0.014	0.136	0.310	0.257	0.378	1965	1973
Hoover-Frankum	Nodaway River	SCS	Mo	FP-E	6 GSS; 4 FRS - 1,024 acre-feet	0.502	0.375	0.041	0.016	0.007	0.003	0.060	1962	1970
Edmund Street Power Plant	Missouri River	St. Joseph Power and Light	Mo	P	Steam plant - 42,500 kw									
Lake Road Power Plant	Missouri River	St. Joseph Power and Light	Mo	P	Steam plant - 150,000 kw									
Squaw Creek NWR	Squaw Creek	BSFW	Mo	F	Total development program	1.418	0.391			0.033		0.994		1971
Atchison	White Clay Creek	CE	Kans	FC	1,000 foot channel improvements, 2,500 foot cut and cove conduit	4.050			1.100	0.844	1.737	0.369	1967	1970
White Clay - Whiskey Creeks	Missouri River	SCS	Kans	FP-E	25 FRS - 6,539 acre-feet	2.635	2.623	0.022					1954	1965
Blockton	Platte River	SCS	Mo	FP-E	24 GSS; 0.7 mile channel improvement; 3 FRS - 1,409 acre-feet	0.550	0.020	0.150	0.028	0.005	0.081	0.266	1964	1971
102 River Tributaries	(Nodaway Platte)	SCS	Mo	FP-E	12 combination GS and FRS - 330 acre-feet	0.543	0.469	0.005	0.002		0.006	0.061	1959	1971
Summit Lake Power Plant	Platte River	S. W. Federated Co-op	Iowa	P	Steam plant - 22,500 kw									
Platte River Tributaries	Platte River	SCS	Mo	FP-E	12 combination GS and FRS - 330 acre-feet	0.374	0.374						1959	1965
Agricultural Levees (Active Program)	Missouri River	CE	Nebr Iowa Kans Mo		507 miles of levees to protect 413,000 acres	129.400	36.239	1.934	3.076	7.457	1.438	84.252	1948	1979
Bank Stabilization and Navigation Project	Missouri River	CE	Nebr. Kans. Ia-Mo	C-E-N-R	Dikes, Revetment; Cutoffs (also in Lower Missouri Subbasin)	442.100	345.387	11.626	8.447	3.603	4.192	68.845		1978
Livestock Ponds	-	SCS	Nebr Iowa Kans Mo	RD	16,000 ponds - surface area 13,000 acres									Continuing Program
Power Plants less than 10,000 kw	-		Iowa Nebr Kans Mo	P	4 Steam plants - 12,600 kw 54 Internal combustion plants 141,296 kw									

	Number Systems	Population Served	MGD
Water Supply			
Population Category			
Urban			
Over 100,000	3	1,490,000	253.0
50-100,000	3	230,000	34.5
10-50,000	4	40,000	5.6
2.5-10,000	36	170,000	23.8
Rural Nonfarm			
to 2,500	1,054	346,000	38.0
Nonfarm (Individual systems)		36,000	2.0
Farm Domestic (Individual systems)		118,000	6.6

State Park — Kansas

Meeker — Driftwood Unit



Red Willow Unit

Dry Creek

Dry Creek — Pilot

Colby Power Plant

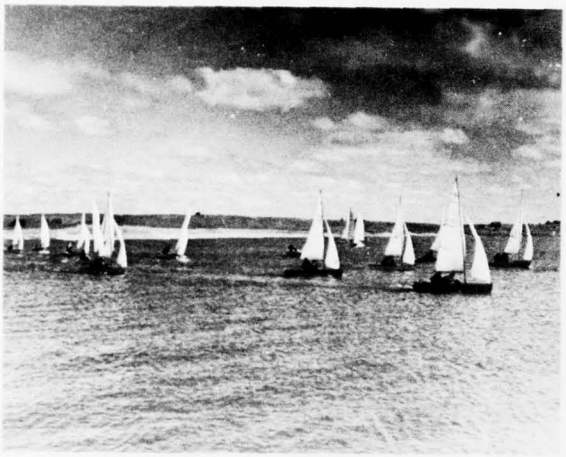
Table 1 (Continued)

MIDDLE MISSOURI SUBBASIN (Cont'd)

		Number Systems	Primary Treatment	Secondary Treatment	No Treatment
Sanitary Treatment Plants 572 Communities	Iowa Nebr Mo Kans Minn	182	22	118	42

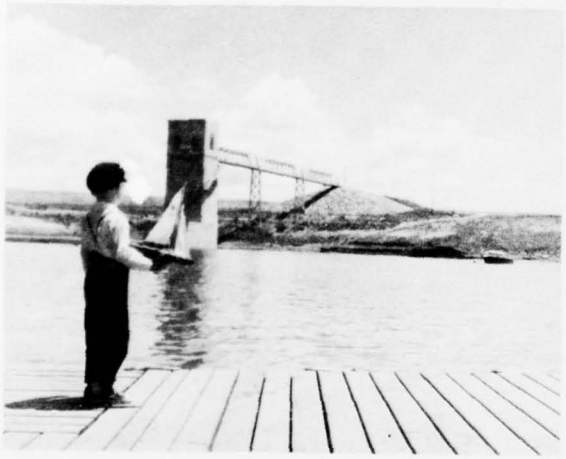
Type	Number of Areas	Acres
State, Local, and Private Recreation Areas		
State	45	10,560
Local	194	4,828
Private	NA	32,897

Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars: Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Schedule (FY): Start	Projected Completion
KANSAS SUBBASIN														
Black Wolf	Republican River	SCS	Colo	FP-R	1 multi-purpose dam - 2,200 acre-feet	0.180		0.100	0.080					1967
Armel Unit, Upper Republican Division	South Fork Republican River	BR	Colo	I-FC-F-R	Bonny Dam and reservoir 170,200 acre-feet. Construction of irrigation distribution works for 6,000 acres deferred.	13.301	13.301						1949	1951
Wray	Republican River	SCS	Colo	FP	6 FRS - storage 340 acre-feet	0.240	0.240						1958	1963
Meeker-Driftwood Unit, Frenchman-Cambridge Division	Republican River	BR	Nebr	I-FC-F-R	Trenton Dam and Swanson Lake 254,000 acre-feet. Irrigation to 16,322 acres.	29.380	29.380						1949	1959
Frenchman Unit Frenchman-Cambridge Division	Frenchman Creek	BR	Nebr	I-FC-F-R	Ender's Dam and reservoir - 74,500 acre-feet. Irrigation to 21,090 acres	21.260	18.759	0.537	0.243	0.262	0.411	1.048	1958	1962
Red Willow Unit, Frenchman-Cambridge Division	Red Willow Creek	BR	Nebr	I-FC-F-R	Red Willow Dam and Hugh Butler Lake. 86,600 acre-feet. Irrigation to 11,150 acres.	13.032	12.845	0.045	0.018	0.020	0.045	0.059	1953	1962
Dry Creek (South)	Republican River	SCS	Nebr	FP	6 FRS - storage 2,962 acre-feet. 1.45 miles floodway.	0.314	0.204	0.029	0.018	0.006			1964	1969
Bartley	Dry Creek	CE	Nebr	FC	Levee and channel improvement	0.118	0.118						1950	1952
Upper Medicine Creek	Medicine Creek	SCS	Nebr	FP-E	3 FWR - storage 12,900 acre-feet	0.605					0.005	0.600	1969	1975
Lower Medicine Creek	Medicine Creek	SCS	Nebr	FP-E	6 FWR - storage 17,373 acre-feet	0.816					0.016	0.800	1969	1978
Cambridge Unit, Frenchman-Cambridge Division	Medicine Creek	BR	Nebr	I-FC-F-R	Medicine Creek Dam and Harry Strunk Lake - 89,300 acre-feet Irrigation to 15,600 acres.	18.186	16.688	0.057	0.096	0.083	0.135	1.127	1948	1955
Dry Creek (Pilot)	Republican River	SCS	Nebr	FP-E	9 GSS, 10 FRS - storage 2,170 acre-feet	0.372	0.372						1954	1960
Indianola	Coon Creek	CE	Nebr	FC	Levee and channel improvements	0.067	0.067						1948	1949
Stamford	Sappa Creek	SCS	Nebr	FP	3.3 miles channel improvement 42 miles dikes - 2 FRS storage 310 acre-feet.	0.176	0.009	0.008	0.084	0.32			1965	1968
Harlan County Lake	Republican River	CE	Nebr.	FC-I-R	Reservoir capacity 850,000 acre-feet.	46.935	45.400	0.050	0.031			1.454	1946	1952
Franklin Unit, Bostwick Division	Republican River	BR	Nebr	I	Irrigation water from Harlan County Reservoir (USCE) to Franklin and Naponee Canals, one pumping plant to irrigate 14,860 acres.	9.739	9.369	0.010	0.006	0.041	0.051	0.262	1951	1956
Colby Power Plant	Prairie Dog Creek	Central Kansas Power	Kans	P	2 - Internal combustion plants 27,710 kw									
Almena Unit, Kanaska Division	Prairie Dog Creek	BR	Kans	I-FC-F-R-M	Norton Dam and reservoir. 134,700 acre-feet. Irrigation for 5,350 acres. 1,600 acre-feet of municipal water annually to Norton, Kansas.	21.089	17.228	1.787	1.572	0.126	0.058	0.318	1962	1967
Norton Power Plant	Prairie Dog Creek	Norton Kansas	Kans	P	Internal combustion plant - 8,750 kw									



Milford Dam And Reservoir

Cedar Bluff Dam And Reservoir



Kanopolis Dam And Reservoir

Ross Beach Power Plant

Table 1 (Continued)

Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars							Schedule (FY)	
						Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Start	Projected Completion
KANSAS SUBBASIN (Cont'd)														
Superior - Courtland Unit, Bostwick Division	Republican River	BR	Nebr	I	Superior - Courtland Diversion Dam diverts water to irrigate 9,380 acres in Nebraska.	9.360	8.939	0.010	0.008	0.041	0.059	0.303	1949	1953
Courtland Unit Bostwick Division	White Rock Creek	BR	Kans	I-FC-F-R	Lovewell Dam and Reservoir 92,200 acre-feet. Irrigation for 49,000 acres in Kansas.	26.906	22.065	0.155	0.196	0.503	0.222	3.765	1955	1961
Clyde	Elk Creek	CE	Kans	FC	Levees and appurtenant works	0.394	0.394						1962	1963
Clay Center Power Plant	Republican River	Clay Center Kansas	Kans	P	Steam plant - 13,000 kw									
Milford Lake	Republican River	CE	Kans	FC-M-R	Reservoir capacity 1,160,000 acre-feet. Includes 300,000 acre-feet for future water supply	48.984	43.175	4.101	1.401		0.307	1.396	1962	1965
Turkey	Smoky Hill River	SCS	Kans	FP-E	15 FRS, 28.3 miles channel 14,799 acre-feet.	1.528		0.003	0.033	0.006	0.012	1.474	1966	1976
Cedar Bluff [4] NFH	Smoky Hill River	BSFW	Kans	F	Fish production facilities and related buildings	0.840	0.450					0.390	1961	1973
Cedar Bluff Unit, Smoky Hill Division	Smoky Hill River	BR	Kans	I-FC-F-R-M	Cedar Bluff Dam and Reservoir 377,000 acre-feet - Irrigation to 6,600 acres - 2,000 acre-feet of municipal water annually to Russell, Kansas	17.972	17.524	0.014	0.031	0.023	0.056	0.324	1949	1963
Hays Power Plant	Smoky Hill River	Central Kansas Power	Kans	P	Steam plant - 19,000 kw									
Russell Power Plant	Smoky Hill River	Russell Kansas	Kans	P	Internal combustion plant - 15,771 kw									
Kanopolis Lake	Smoky Hill River	CE	Kans	FP-I-M-R	Reservoir capacity - 450,000 acre-feet	12.662	12.397	0.038	0.030	0.055	0.020	0.122	1940	1948
Salina	Smoky Hill River	CE	Kans	FC	4.3 miles channel improvement. 6.4 miles diversion of Dry Creek. 17.1 miles levees.	3.879	3.879						1957	1961
Spillman Creek	Saline River	SCS	Kans	FP-E	21 FRS - 2 GSS - storage 18,940 acre-feet	1.819			0.001	0.001	0.022	1.795	1967	1975
Wilson Lake	Saline River	CE	Kans	FC-I-R-N	Reservoir capacity 776,000 acre-feet	20.364	20.364						1961	1965
Lost Creek (Pilot)	Saline River	SCS	Kans	FP-E	2.45 miles channel improvement 4.25 miles floodways 3 FRS - storage 897 acre-feet	0.180	0.180						1954	1960
Ross Beach Power Plant	Solomon River	Central Kansas Power	Kans	P	Steam plant - 37,650 kw									
Webster Unit, Solomon Division	South Fork Solomon River	BR	Kans	I-FC-F-R	Webster Dam and reservoir, 260,700 acre-feet. Woodston Diversion Dam.	17.682	17.258	0.010	0.005	0.005	0.038	0.366	1953	1961
Kirwin NWR [4]	Solomon River	BSFW	Kans	F	Dryland farming of 2,300 acres for waterfowl	0.271	0.127					0.144	1956	1975
Kirwin Unit, Solomon Division	Solomon River	BR	Kans	I-FC-F-R	Kirwin Dam and reservoir, 314,550 acre-feet. Irrigation to 11,500 acres.	20,013	19.437					0.576	1952	1958
Glen Elder Unit, Solomon Division	Solomon River	BR	Kans	I-FC-F-R-M	Glen Elder Dam and Waconda Lake - 975,575 acre-feet - 2,000 acre-feet of municipal water to Beloit, Kansas. Irrigation to 21,000 acres deferred.	62.639	13.370	13.916	10.993	11.464	4.971	17.925	1964	1971
Beloit Power Plant	Solomon River	Beloit Kansas	Kans	P	Internal combustion plant - 17,350 kw									
Barnard	Rattle-snake & Salt Creeks	CE	Kans	FC	8,800 feet of levees	0.128	0.128						1957	1959
Abilene	Mud Creek	CE	Kans	FC	16,000 feet levees; 18,000 feet channel improvement, 900 feet floodwall	1.100	1.100						1957	1960
Riverside Plant	Saline River	Kansas Power and Light	Kans	P	Steam plant - 33,750 kw									
Hastings Power Plant	Big Blue River	Hast-ings, Nebr	Nebr	P	Steam plant - 54,000 kw									
Fairbury Power Plant	Little Blue River	Fair-bury, Nebr	Nebr	P	Steam plant - 21,000 kw									

Dorchester

Big Indian

Homestead National Monument

Tuttle Creek Dam And Reservoir

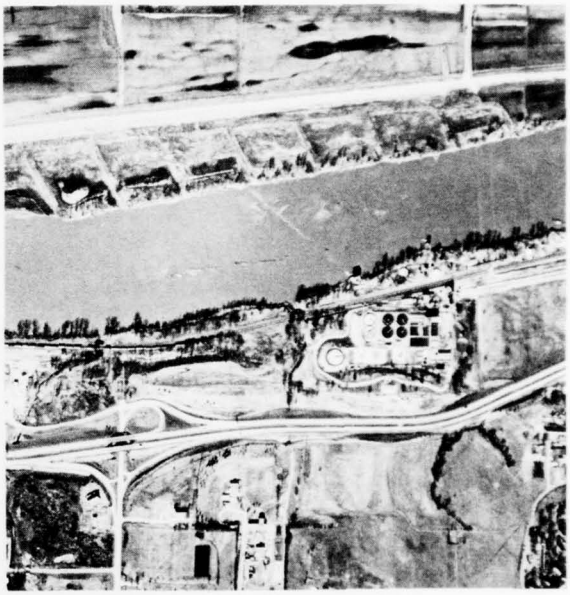
Topeka

Tecumseh Power Plant

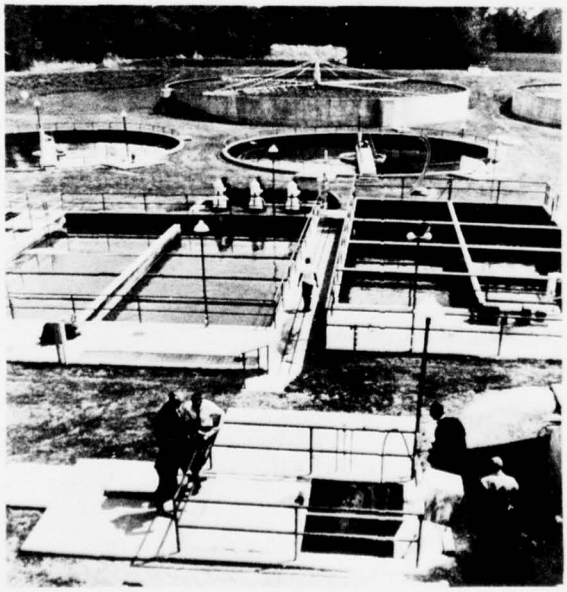
Table 1 (Continued)

Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars							Schedule (FY)	
						Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Start	Projected Completion
KANSAS SUBBASIN (Cont'd)														
Seward	Big Blue River	CE	Nebr	FC	8,270 feet levees	0.127	0.127						1953	1953
Dorchester	Big Blue River	SCS	Nebr	FP-E	4 FRS - storage 973 acre-feet	0.191	0.059	0.065	0.005	0.003	0.002	0.057	1965	1970
Clatonia	Big Blue River	SCS	Nebr	FP-E	8 FRS - storage 4,370 acre-feet	0.450						0.450	1970	1975
Little Indian Creek (Pilot)	Big Blue River	SCS	Nebr	FP-E	24 FRS - storage 5,290 acre-feet - 39 GSS	0.894	0.894						1954	1964
Bear, Pierce, Cedar	Big Blue River	SCS	Nebr	FP-E	6 GSS - 27 FRS - storage 11,396 acre-feet	1.608	0.177	0.073	0.102	0.058	0.120	1.078	1964	1972
Mud Creek	Big Blue River	SCS	Nebr	FP-E-R	20 GSS, 11 FRS - 8,612 acre-feet	1.015	0.499		0.141	0.054	0.084	0.237	1959	1971
Cub Creek	Big Blue River	SCS	Nebr	FP-E	6 GSS, 14 FRS - 12,155 acre-feet	1.231		0.050	0.035	0.084	0.129	0.933	1963	1974
Big Indian	Blue River	SCS	Nebr	FP-E	3 GSS, 32 FRS - 27,102 acre-feet	2.630	0.536	0.137	0.228	0.261	0.140	1.328	1962	1973
Plum	Big Blue River	SCS	Nebr	FP-E	7 GSS, 25 FRS - 6,971 acre-feet, 27 miles channel improvement.	1.378	0.516	0.080	0.093	0.172	0.113	0.404	1962	1972
Mission	Big Blue River	SCS	Nebr	FP-E	4 GSS, 12 FRS - 7,200 acre-feet	0.501			0.023	0.023	0.187	0.268	1964	1973
Snipe (Pilot)	Big Blue River	SCS	Kans	FP	6 FWR - 891 acre-feet	0.143	0.143						1954	1958
Homestead National Monument		NPS	Nebr	R	Historic - commemorates the Homestead Act. Visitor Center, parking, trails, interpretive facilities.	0.468					0.371 (thru FY-68)	0.097	1936	Continuing Program
32 Mile	Little Blue River	SCS	Nebr	FP	6 FRS - 7,568 acre-feet 1.8 miles channel and dike	0.389			0.007	0.023	0.075	0.274	1968	1976
Bowman Spring	Little Blue River	SCS	Nebr	FP	8 FRS - 4,299 acre-feet	0.411	0.241	0.014	0.003		0.045	0.108	1959	1971
Irish Creek	Blue River	SCS	Kans	FP-E	8 GSS - 8 FWR - storage 5,773 acre-feet	1.100			0.017	0.024	0.107	0.952	1967	1975
Buckley Creek	Little Blue River	SCS	Nebr	FP	6 FRS - 3,618 acre-feet	0.349	0.114	0.051	0.012	0.004		0.167	1960	1971
North Black Vermillion	Blue River	SCS	Kans	FP-E	35 GSS - 22 FWR - 25,316 acre-feet. 4.2 mile channel improvement.	4.207			0.013	0.049	0.051	4.094	1967	1975
Upper Black Vermillion	Blue River	SCS	Kans	FP-E-M-R	25 GSS and 12 FRS - storage 10,677 acre-feet. 12 mile channel improvement.	3.955			0.024	0.074	0.036	3.821	1967	1975
Frankfort	West Fork Black Vermillion River	CE	Kans	FC	4.0 miles of levee and 1.8 miles channel improvement	1.294	1.294						1962	1964
Tuttle Creek	Blue River	CE	Kans	FC-R-N-W	Reservoir capacity - 2,346,000 acre-feet	80.537	79.875	0.128	0.137	0.092	0.005	0.300	1952	1967
Manhattan	Blue and Kansas Rivers	CE	Kans	FC	6.2 miles of levee and 4,100 feet channel improvement	2.489	2.481		0.008				1961	1965
Topeka	Kansas River	CE	Kans	FC	Levees, channel improvements and appurtenant works	20.400	15.286	1.246	1.100	0.652	0.439	1.677	1938	1971
Tecumseh Power Plant	Kansas River	Kansas Power and Light	Kans	P	Steam plant - 346,100 kw									
Little Delaware Mission (Pilot)	Delaware River	SCS	Kans	FP-E	21 GSS, 8 FRS - storage 4,510 acre-feet	0.602	0.602						1954	1960
Little Delaware Tributaries	Delaware River	SCS	Kans	FP-E	2 GSS and 16 combination GS-FRS - storage 2,571 acre-feet	0.608		0.040	0.202	0.119	0.140	0.101	1964	1970
Nebo Creek	Delaware River	SCS	Kans	FP-E	1 mile Floodway 3 FRS - 584 acre-feet	0.330	0.325	0.005					1962	1965
Holton Power Plant	Delaware River	Holton Kansas	Kans	P	Internal combustion plant - 10,500 kw									
Thompsonville	Delaware River	SCS	Kans	FP-E	1 mile Floodway FRS - 584 acre-feet	0.129	0.129						1958	1961
Perry Lake	Delaware River	CE	Kans	FC-R-M	770,000 acre-feet storage	48.400	12.855	11.500	6.900	5.275	5.920	5.986	1964	1970
Stonehouse	Stonehouse Creek	CE	Kans	FC	Channel improvement and levees (includes rehabilitation)	0.280	0.143				0.137		1951	1969

Livestock Ponds



Water Supply — Topeka, Kansas



Sanitary Treatment Plants

Kansas Citys

Table 1 (Continued)

Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars: Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Schedule (FY): Start	Projected Completion
KANSAS SUBBASIN (Cont'd)														
Lawrence	Kansas River	CE	Kans	FC	18.2 miles new levee - 1.1 mile levee raise - 6.1 miles channel improvement, Medicine Creek	6.500	0.418	0.950	0.290	0.105	1.130	3.607	1967	1974
Lawrence Power Plant	Kansas River	Kansas Power and Light	Kans	P	Steam plant - 210,150 kw									
Upper Wakarusa	Kansas River	SCS	Kans	FP-E-M	FRS - multi-purpose structures	2.815			0.021	0.047	0.073	2.674	1963	1974
Lower Wakarusa	Kansas River	SCS	Kans	FP-E-M	FRS - multi-purpose structures and floodways	1.082			0.002	0.013	0.060	1.007	1963	1973
Clinton Lake	Wakarusa River	CE	Kans	FC-R-W	Reservoir capacity 397,000 acre-feet	41.500	0.295	0.400	0.835		0.500	39.470	1968	
Stranger Creek	Stranger Creek	CE	Kans	FC	Levees and appurtenant works	0.340	0.340						1963	1964
Livestock Ponds	-	SCS	Kans Nebr	RD	38,000 ponds - surface area 46,000 acres									
Power Plants Less than 10,000 kw	-		Colo Kans Nebr	P	1 - steam plant - 8,000 kw 8 - hydro plents - 4,488 kw 59 - internal combustion plants - 175,630 kw									

	Number Systems	Population Served	MGD
Water Supply			
Population Category			
Urban			
Over 100,000	1	135,000	23.0
50-100,000			
10-50,000	7	185,000	26.0
2.5-10,000	25	127,000	15.0
Rural Nonfarm			
to 2,500	315	182,000	21.7
Nonfarm (Individual systems)		130,000	4.6
Farm Domestic (Individual systems)		183,000	6.0

	Number Systems	Primary Treatment	Secondary Treatment	No Treatment
Sanitary Treatment Plants 408 Communities[8]	231	30	198	3

Kans Colo Nebr

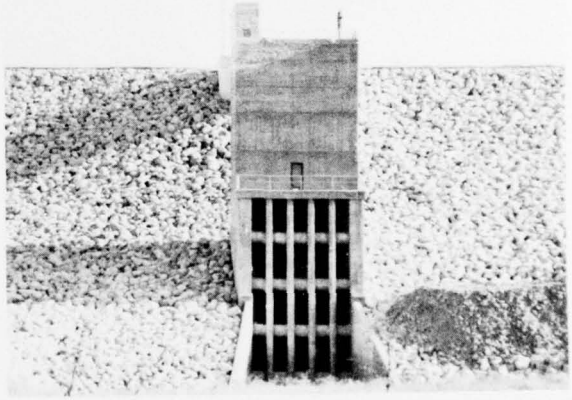
Type	Number of Areas	Acres
State	130	1,665
Local	390	4,206
Private	NA	35,682

State, Local, and Private Recreation Areas

Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars: Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Schedule (FY): Start	Projected Completion
LOWER MISSOURI SUBBASIN														
Wyandotte Reservoir	Marshall Creek	Wyandotte County	Kans.	R	6,900 acre-feet storage surface area 305 acres									1943
Ralph Green Power Plant	-	Mo. Public Service	Mo.	P	Steam plant - 49,500 kw									
Kansas Citys	Kansas & Missouri Rivers	CE	Kans. Mo.	FC	Levees, channel improvement and appurtenant works	42.500	42.207				.010	.248	1940	
Kaw Station Power Plant	-	Kansas City	Kans.	P	Steam plant - 161,280 kw									
Quindaro Power Plant	-	Kansas City	Kans.	P	Steam plant - 186,100 kw									
Grand Avenue Power Plant	-	Kansas City Power and Light	Mo.	P	Steam plant - 126,750 kw									
Hawthorne Power Plant	-	Kansas City Power and Light	Mo.	P	Steam plant - 908,080 kw									

Tabo Creek

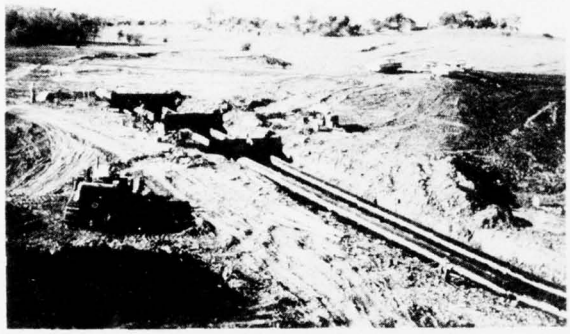
East Fork Big Creek



Rathbun Dam And Reservoir

Table 1 (Continued)

Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars							Schedule (FY)	
						Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Start	Projected Completion
LOWER MISSOURI SUBBASIN (Cont'd)														
Northeast Power Plant	-	Kansas City Power and Light	Mo.	P	Steam plant - 156,000 kw									
Dodgion Power Plant	-	City of Independence	Mo.	P	Steam plant - 10,000 kw									
Jackson St. Power Plant		City of Independence	Mo.	P	Gas Turbine - 36,000 kw									
Blue Valley Power Plant	-	City of Independence	Mo.	P	Steam plant - 115,000 kw									
Missouri City Power Plant	-	Northwest Electric Power Co-op	Mo.	P	Steam plant - 40,000 kw									
Sibley Power Plant	-	Mo. Public Service	Mo.	P	Steam plant - 518,500 kw									
Williams Creek	Fishing R.	S.C.S.	Mo.	FP	4 FRS - 4,273 acre-feet	0.358			0.003	0.032	0.134	0.375	1967	1972
Wellington-Napolean	Missouri River	S.C.S.	Mo.	FP-E	4 GSS; 17 FRS - 2,282 acre-feet	0.582	0.027	0.106	0.035	0.288	0.117	0.009	1966	1971
Little Sni-A-Bar	Missouri River	S.C.S.	Mo.	FP-E	22 G.S. Str. 3 FRS - 4,930 acre-feet	0.542					0.002	0.802	1969	1977
Willow Creek	Missouri River	S.C.S.	Mo.	FP-E	10 G.S. Str. 3 FRS - 1,967 acre-feet	0.542			0.029	0.038	0.177	0.298	1967	1972
Tabo Creek	Missouri River	S.C.S.	Mo.	FP-E	85 GSS; 11 FRS - 4,286 acre-feet	2.139	1.590	0.078	0.202	0.042		0.227	1960	1970
Three Mile	Thompson River	S.C.S.	Iowa	FP-E-R	27 GSS; 5 FWRS; 1 recreation structure - 15,898 acre-feet. 5.8 mile channel improvement.	1.365			0.013	0.026	0.122	1.204	1967	1975
East Fork Big Creek	Grand River	S.C.S.	Mo.	FP-E	10 GSS; 3 FRS - 3,818 acre-feet	0.408	0.371	0.009	0.003	0.002	0.002	0.021	1959	1967
Panther Creek	Grand River	S.C.S.	Mo.	FP-E	6 GSS; 4 FRS - 1,945 acre-feet	0.558	0.220	0.027	0.003	0.016	0.309		1964	1969
Grindstone-Lost Muddy	Grand River	S.C.S.	Mo.	FP-E	50 GSS; 14 FWR - 20,375 acre-feet	2.744		0.033	0.061	0.191	0.490	1.969	1963	1971
Carrollton Power Plant	-	Carrollton Municipal	Mo.	P	Internal combustion plant - 16,369 kw									
Chillicothe Power Plant	-	Chillicothe Municipal	Mo.	P	Steam plant - 15,000 kw									
Swan Lake NWR	Grand River	BSFW	Mo.	F	Total development program	0.367	0.257					0.110		(1976 or later)
Honey Creek (Pilot)	Chariton River	S.C.S.	Iowa	E	2 GSS	0.239	0.239						1954	1958
Rathbun Lake	Chariton River	CE	Iowa	F-N-R FC-W	552,000 acre-feet storage, total 347,000 acre-feet Flood control storage.	26.500	2.759	6.000	5.500	3.335	3.600	5.306	1964	1970
Moulton	Chariton River	S.C.S.	Iowa	FP-E	8 GSS; 13-mile channel improvement; 3 FRS - 1,157 acre-feet.	0.230	0.136	0.003	0.001	0.010	0.080		1963	1969
Thomas Hill Dam & Reservoir	Chariton River	ACP	Mo.	FC	Storage - 76,600 acre-feet	4.890							1964	1965
Chariton River	Chariton River	CE	Mo.	FC	Channel improvement and levees	8.500	2.222	1.400	0.790	0.805	0.450	2.833	1948	1971
East Branch South Fork Blackwater River	Blackwater River	S.C.S.	Mo.	FP-E	21 combination stabilization and water flow control structures - 844 acre-feet	0.424	0.424						1954	1958
Sedalia Power Plant		Mo. Public Service	Mo.	P	Steam plant - 11,500 kw									



South Fork Blackwater

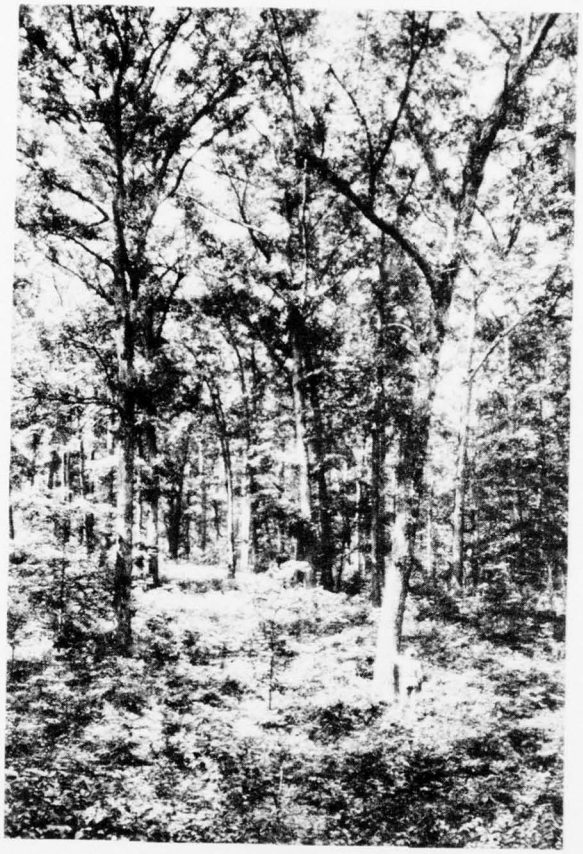
Pomona Dam And Reservoir

Ottawa

Pomme de Terre Dam And Reservoir

Table 1 (Continued)

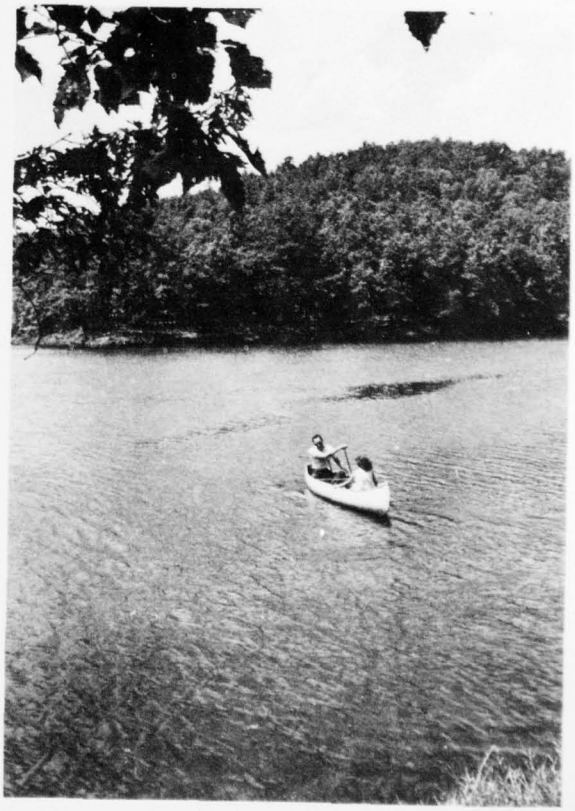
Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars							Schedule (FY)	
						Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	bal. to Comp.	Start	Projected Completion
LOWER MISSOURI SUBBASIN (Cont'd)														
Marshall Power Plant		Marshall Municipal	Mo.	P	Steam plant - 30,500 kw									
South Fork Blackwater	Blackwater River	S.C.S.	Mo.	FP-E	14 GSS; 5 FRS - 7,604 acre-feet	1.116	0.356	0.118	0.033		0.070	0.539	1962	1972
Columbia Power Plant		Columbia Municipal	Mo.	P	Steam plant - 66,661 kw. Internal combustion plant - 12,500 kw									
Calahan Creek	Missouri River	S.C.S.	Mo.	FP	6 FRS - 2,200 acre-feet	0.488	0.026	0.120	0.038	0.001		0.303	1963	1972
Cedar Creek L.U. Project	Cedar Creek	FS	Mo.	WP	Land utilization project								1940	Continuing Program
Jefferson City Power Plant		Mo. Power and Light	Mo.	P	Steam plant - 12,700 kw									
Switzler Creek (Pilot)	Marias de Cygnes River	S.C.S.	Kans.	FP-E	4 FRS - 3,396 acre-feet	0.318	0.318						1954	1963
Pomona Lake	Marias de Cygnes River	CE	Kans.	FC-R-M-W	Reservoir storage 246,500 acre-feet	14.153	13.290		0.043	0.105	0.007	0.708	1959	1963
Frog Creek	Marias de Cygnes River	S.C.S.	Kans.	FP-E	8 FRS - 4,661 acre-feet	0.505	0.399	0.009	0.045	0.001	0.005	0.048	1962	1971
Melvern Lake	Marias de Cygnes River	CE	Kans.	FC-R-W	Storage 363,000 acre-feet	31.100	0.700	0.750	1.000	2.429	5.636	20.585	1967	1972
Ottawa	Marias de Cygnes River	CE	Kans.	FC	4.2 miles levees; 2.3 miles channel. Improvement, 1,500 feet flood walls; 3 pumping plants.	4.462	4.462						1958	1962
Ottawa Power Plant		Ottawa Municipal	Kans.	P	Internal combustion plant - 11,800 kw									
Osawatomie	Pottawatomie Creek	CE	Kans.	FC	4.8 miles levee	2.060		0.200	0.125	0.205	0.485	0.962	1968	1970
Main Street Power Plant		Springfield Municipal	Mo.	P	Steam plant - 11,000 kw									
Springfield Power Plant		Springfield Municipal	Mo.	P	Internal combustion plant - 18,000 kw									
Stockton Lake	Sac River	CE	Mo.	FC-P-R	Storage 1,674,000 acre-feet Hydro-power 45,200 kw	70.000	10.890	11.500	12.300	10.700	13.834	21.666	1963	1973
Osceola	Osage River	Mo. Public Service Co.	Mo.	P	1,600 kw Hydro-power plant									
Clinton Power	-	Mo. Public Service	Mo.	P	Steam Plant - 12,500 kw									
Montrose Power Plant	-	Kansas City Power and Light	Mo.	P	Steam Plant - 563,100 kw									
Pomme de Terre Lake	Pomme de Terre River	CE	Mo.	FC-R-N	Reservoir - 650,000 acre-feet storage (Power deferred)	17.130	15.313	0.172	0.050	0.084	0.026	1.511	1957	1965
Harry S. Truman Dam & Reservoir	Osage River	CE	Mo.	FC-R-P	Reservoir storage 5,202,000 acre-feet. Power - 6 pump-turbine generators - 160,000 kw	227.000	5.700	7.000	10.450	5.850	5.200	192.806	1964	1979
Niangua	Niangua River	Sho-Me Power Co.	Mo.	P	3,000 kw Hydro-power plant									
Bagnell Dam	Osage River	Union Electric Power Co.	Mo.	P	176,200 kw - Hydro-power plant storage 1,973,000 acre-feet									1931



Clark National Forest

Livestock Ponds

Sanitary Treatment Plant



State Park

Table 1 (Continued)

Name of Development	Stream	Agency	State	Function	Description	Program in Millions of Dollars: Est. Total	Thru 1965	F.Y. 1966	F.Y. 1967	F.Y. 1968	F.Y. 1969	Bal. to Comp.	Schedule (FY): Start	Projected Completion
LOWER MISSOURI SUBBASIN (Cont'd)														
Fullerton Power Plant	-	Fullerton Municipal	Mo.	P	Steam plant - 11,500 kw									
Chamois Power Plant	-	Central Electric Power Co-op	Mo.	P	Steam plant - 59,000 kw									
Clark National Forest	Gasconade River	FS	Mo.	WP-R F-G-FR	164,000 acres - 650 acres recreation water - 2 developed recreation areas.								1934	Continuing Program
New Haven	Missouri River	CE	Mo.	FC	2,000 feet of levee	0.140	0.140						1955	1955
Kirksville Power Plant	-	Mo. Power and Light	Mo.	P	Internal combustion plant - 15,000 kw									
Livestock Ponds	-	SCS		RD	105,000 ponds - 105,000 acres surface area									
Power Plants less than 10,000 kw	-			P	2 - steam plants - 12,500 kw 2 - hydro-plants - 4,600 kw 42 - internal combustion - 144,035 kw									

	Number Systems	Population Served	MGD
Water Supply			
Population Category			
Urban			
Over 100,000	3	1,010,000	171.7
50-100,000	2	210,000	29.4
10-50,000	9	192,000	26.9
2.5-10,000	41	193,000	29.5
Rural Nonfarm			
to 2,500	236	216,000	21.0
Nonfarm (Individual systems)		307,000	10.8
Farm Domestic (Individual systems)		295,000	9.7

		Number Systems	Primary Treatment	Secondary Treatment	No Treatment
Sanitary [8] Treatment Plants 340 Communities	Mo	203	15	178	10

	Type	Number of Areas	Acres
State, Local, and Private Recreation Areas	State	59	23,920
	Local	217	8,622
	Private	NA	NA

NOTES

[1](Milk River Project — #1) Project provides for diversion of 135,000 acre-feet of water annually from St. Mary's River to the Missouri Basin — Milk River.

[2](Garrison Diversion Unit) Principal features of this unit are in the Missouri River Basin; however, a portion of the project land is in the Souris and Red Rivers basins. 59,300 acres of irrigable lands are within the Missouri Basin; the unit involves 664,000 acre-feet of average annual diversion out of the Missouri Basin.

[3](Bureau of Sport Fisheries and Wildlife) 19,429 acres of this land are included in the Charles M. Russell National Wildlife Refuge; acquisition has just begun.

[4](Bureau of Sport Fisheries and Wildlife) Lands partially or wholly owned by another public or private agency but managed by BSFW.

[5](Bureau of Sport Fisheries and Wildlife) All private lands but administered by BSFW.

[6](Colorado — Big Thompson Project) Includes $2,262,569 interest during construction.

[7](Colorado — Big Thompson Project) Transmountain diversion of 257,700 acre-feet of water annually under the Continental divide through the 13.1 mile Alva B. Adams Tunnel to the Eastern slope. Major outbasin features include Shadow Mountain Dam and Reservoir, 18,400 acre-feet; Green Mountain Dam and Reservoir, 154,600 acre-feet; Granby Dam and Reservoir, 539,800 acre-feet; Willow Creek Dam and Reservoir, 10,600 acre-feet; one power plant; and 6.3 miles of feeder canal. An estimated cost of $52,000,000 for outbasin features is included in costs shown.

[8]Does not include institutional or industrial plants treating their own sewage.

[9](National Park Service) Portions of park lands outside of basin. Area listed is for entire park area.